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U. S. Hydrographic Office—Bureau of Navigation.

THE AZORES OR WESTERN ISLANDS.

TRANSLATED FROM THE FRENCH OF

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WITH

ADDITIONS TO THE PRESENT DATE,

BY

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THE AZORES.

The Azores or Western islands are a group lying between $36^{\circ} 50'$ and $39^{\circ} 45'$ N. latitude, and 27° and $33^{\circ} 40'$ W. longitude.

This group, belonging to Portugal, is composed of nine islands, viz: Corvo and Flores to the NW.; Graciosa, Fayal, San Jorge, Pico, and Terceira in the center; and San Miguel and Santa Maria to SE.; besides an islet and bank called Formigas, a short distance to NE. of Santa Maria.

It does not appear that the ancients had any knowledge of any group in this sea except the Canaries, to which they finally applied the celebrated appellation of the Fortunate islands; but two Arabian geographers describe, after the Canaries, nine other islands in the Western ocean, probably the Azores; for their number is nine, and, besides, a species of hawk is specially noticed by these writers as existing there in great abundance, a circumstance that afterward appeared so remarkable to the Portuguese that they named them the Azores or Hawk islands. History.

The first European discovery of this group is claimed by the Flemings, a merchant named Van der Berg having been driven on these shores in 1439. In 1459 the islands were planted and colonized, and in so fertile a soil the inhabitants rapidly multiplied. In 1580 they fell with other Portuguese possessions under the dominion of Spain, and returning afterward to their former owners, within a recent period attracted some attention as the theater of contest between the parties contending for the throne of Portugal, Queen Maria's authority being eventually established throughout.

The aspect of all the islands is very similar in general characteristics, presenting an elevated and undulating outline with little or no table-land, and rising into peaks from 1,889 to 7,613 feet above the level of the sea. Their lines of sea-coast are, with few exceptions, high and precipitous, Physical aspect.

recent search has failed to discover any change in the character or shape of the bottom.

Earthquakes are of frequent occurrence, and often are productive of disastrous results to the various towns of the island.

Winds.

The prevailing winds of summer are from NE. to E., and the wind is never steady long, unless it rises gradually and sets in well to the eastward at first. The prevailing winds of winter are from NW., W., and SW., generally fresh, and the latter accompanied by heavy rains. Occasional S. and SE. winds bring violent squalls, as do those from N. W. Gales usually blow between SW. and NW., or from NE. or SE., the latter with a generally clear sky.

As with all high lands, the winds near the islands are very variable, the prevailing wind being divided into currents that reunite far to leeward, leaving calm belts and variable breezes that often seriously interfere with navigation near the shores.

No lasting fine weather should be expected in this archipelago except between May, or even the summer solstice, and the autumnal equinox. In this period there are often long calms, broken by quickly shifting breezes.

About Corvo and Flores the weather is very changeable at all seasons of the year, and even in summer fresh NW. and SW. winds are experienced, with storms and rain.

In winter, besides heavy gales and a rough sea, rains and thick fogs often occur throughout the archipelago.

It is an important fact to remember that SW. gales usually haul to the W. and then to NW., where, as a rule, they moderate. So that vessels obliged to leave an unprotected anchorage on account of these storms should go northward rather than southward during the continuance of bad weather; then when the wind hauls to NW., or N., they can regain their port without difficulty.

From a series of observations, taken at the 5 chief islands of the group, the storms appear to be of a rotatory character, (interfered with, however, by the great altitude of Pico,) but not a regular course of progression. Some tend to the SE., others to the NE.; none appear to pass to the westward or to range from due E. more than between NNE. and SSE. Storms are not frequent, nor are they

generally of long duration, but they are heavy while they last.

The waters of the Gulf stream almost reach Corvo and Flores, and sometimes do extend to the eastward of them. Tides and currents.
The general direction of the stream is SE., but along these islands and in the channel separating them from Fayal and the central group, currents setting to NE. and NW. are not uncommon.

At a certain distance N. of the archipelago the general currents are from S. to SE. from SW., and more rarely from SSW., and in the group near Terceira and Graciosa occasionally from WNW. In August and September, 1847, Captain Nouvel, of the French ship *Gard*, encountered strong currents setting N. north of the Azores, between 42° and 44° N. latitude, and 28° and 33° W. longitude; and here also he met a strong E. wind, which blew with extraordinary tenacity for 25 days.

It is, therefore, so difficult to determine accurately the currents near these islands, that it may be said they are as variable as the winds. Lying between the Gulf stream on the W. and the northerly African current on the E., there are eddy currents and others, affected by the tidal current, whose velocity rarely exceeds $\frac{3}{5}$ to $\frac{4}{5}$ of a mile an hour.

The time of high water is from 12h. 15m. to 12h. 30m., and the rise is $5\frac{1}{4}$ to $6\frac{1}{2}$ feet.

Navigation in this group is, as a rule, clear of dangers and free from any great difficulty, except from the constant changeableness of weather and the irregularity of the currents. Navigation. There are a few under-water rocks, but most of the dangers are visible and easily avoided, and the coasts are clean and safe. Sudden squalls and storms are not unfrequent.

Vessels from the South Atlantic for Europe often touch at the Azores to verify their position and take a new point of departure, but, unless in need of provisions, it is unwise to do so. It is better to keep well to the westward, where the winds from W. and NW. are more regular than near the islands. But in coming from Senegal in the months of June, July, and August, a vessel may pass to eastward of the Azores and make a good passage.

Vessels forced to put in at these islands with the probability of remaining for any length of time, will find Horta

in Fayal, the best port, as it is the safest and the best provided with marine stores, &c. Provisions are abundant, and there is a coal-depot in the town.

Population. The population of the entire archipelago is estimated at about 180,000.

CORVO.

Corvo, the northernmost and smallest island of the archipelago, has a tolerably regular outline, the eastern coast being almost a semicircle, and the western forming a projecting angle terminating in Oeste point.

Aspect. The Caldeira consist of a group of mountains highest to the S., whose summits are united, inclosing a space $\frac{2}{3}$ of a mile in diameter at the upper and $\frac{1}{3}$ of a mile at the lower part. The bottom of this pit or crater is a plain, dotted here and there with hillocks, and with 4 lakes, 2 being of considerable size. The level of these lakes is 1,277 feet above the sea; the height of the mountains on the N. from 1,434 to 2,199, and on the S. from 2,460 to 2,548 feet.

Seen from NW. or SE. the northern mountains are well detached, but from other directions they often appear as one; from these points they appear like a saddle. The middle of the Caldeira is N. 58° W. from the peak of Fayal, distant 133 miles.

Point Pesqueiro, the S. point of the island, is a low, rocky point, fronted by rocks extending out about 325 yards. Rocks front the coast thence at the same distance to the S E. point, (also low and rocky,) and as far as the southern part of the town of Rosario. Between the two points is a brook, where there is a good landing.

Rosario anchorage.

Just N. of the SE. point of Corvo is Rosario, the only passable anchorage of the island. The town of the same name is on the low, rocky shore, just S. of a little water-course. Farther N. the coast rises and is formed of abrupt cliffs, generally clean and safe.

Two dangerous shoals lie off the SE. point; one is 505 yards S. of the point, with $4\frac{1}{2}$ fathoms water on it, and the other 503 yards S. 78° E. of the point and S. 43° E. from Rosario church, in 3 fathoms. There are 12 fathoms water between the two and deep water all around.

Directions.

A vessel from NE. or E., in making Rosario anchorage, should keep on the parallel of the village church, and let go

in $15\frac{1}{2}$ fathoms at a little more than $\frac{1}{2}$ a mile, or in 9 fathoms $\frac{1}{3}$ of a mile from the shore, sandy bottom. The width of the bank of soundings abreast the town is $1\frac{1}{2}$ miles. At this distance there is a depth of 56 fathoms, increasing rapidly to 207 fathoms a little farther out. Inside of the first-named sounding the depths decrease regularly toward shore.

In making this anchorage from the SW. an offing of at least $\frac{2}{3}$ of a mile should be kept, on account of the shoals, until the SE. point is rounded and the vessel is on the parallel of the church. The road is only sheltered from north-westerly winds.

From Rosario anchorage the E. coast is formed of high bluff cliffs, with some rocks close along the base. Point Casa is high and surmounted by a little conical hill, and off the point are two rocks, always above water. One is abreast the point and not more than 325 yards distant, and the other lies the same distance off shore, a little to the northward. Coast.

From Casa to Moira or Nordeste point the coast describes a regular arc, convex to NE. It is of high cliffs, with a few rocks along the base.

About $\frac{1}{3}$ of a mile N. of Nordeste point is a dangerous submarine rock, where the sea breaks in heavy weather or with a fresh wind; but in fine weather nothing marks it, although it is nearly awash. To avoid it an offing of 1 mile should be kept. Moira shoal.

From Nordeste to Torrais, the NW. point of the island, the shores are high, falling in steep slopes to the sea. Between Norte and Torrais points are several rocks and islets, and some 200 yards NW. of Torrais is a shoal. Coast.

To the southward of this point the shore is low, but the land rises rapidly in rear. The coast here runs almost in a right line to Blanca or Oeste point, the westernmost point of the island. Point Oeste is still higher than Torrais, and the southern part of it is formed of perpendicular cliffs. Between the two the coast is clean and safe.

Farther S. rocks lie along the coast at a distance, sometimes, of about 325 yards. One of them, 148 feet high, is named the Sugarloaf. It is in the northern part of a bight or shallow bay in the southern part of the island, where anchorage may be taken in 15 to 17 fathoms water, sand, with Sugarloaf anchorage.

the Sugarloaf bearing E. distant about $\frac{1}{3}$ of a mile, or farther out in 24 or 25 fathoms. The roadstead is protected from winds from N. to SE., through E. In this bight there is a small sand beach, where landing may be made.

Soundings.

The bank of soundings about Corvo is almost a circle. Near point Pesqueiro it is $\frac{2}{3}$ of a mile wide, increasing to $1\frac{1}{3}$ miles along the E. coast, and to $1\frac{2}{3}$ miles along the N. and W. coasts. E. of the island the bottom is of sand or coral, with patches of rock, and W. of it of sand or gravel and rocks. Care should be taken in letting go to ascertain first the nature of the bottom and the depth of water. Beyond the dangers already mentioned there are none that are not close inshore and well defined.

Channel.

The channel between Corvo and Flores is $9\frac{1}{2}$ miles wide, and there is a belt 3 miles wide, where no bottom has been found at 785 fathoms. It is perfectly clear of dangers, apparent or hidden, or at least none have as yet been discovered.

FLORES.

Aspect.

Flores is a high, mountainous island of irregular outline. The central part is a plateau of no great extent, surrounded by high mountains, and in the plateau are two lakes. The highest mountain, Morro Grande, in the northern part, is 3,087 feet high. S. of the plateau is Pico Caboco, 2,466 feet. In the SE. part is Lomba da Vaca, 2,160 feet; and a little N. of this is another mountain, 2,110 feet high. In the eastern part of the island is the peak of Se, 2,366 feet, and Francisco, 1,434 feet high. Still farther E., and nearly on the parallel of Santa Cruz, the capital of the island, are the peaks of Casino and Santa Cruz, 1,682 and 700 feet high, and there are several other mountains in the SW. part and along the S. coast.

Resources.

Flores is well populated, the inhabitants being divided between two boroughs and four villages. Grain and vegetables are abundant; cattle plenty, but small. Pigs and sheep are raised, and the poultry is said to be the finest in the world, but the surplus produce is not of much importance. Some linen-stuffs are made, and there is a kind of moss, named orchilla, from which a scarlet dye is produced. The work of gathering this moss from the rocks to which it

clings is fatiguing and dangerous. Wood and water are abundant.

Point Delgada, the northernmost point of the island, is moderately high, rounded, and surmounted by a small conical hill. It is surrounded by rocks and a few islets. These islets, like the point, are steep-to, and near them are found from 8 to 20 fathoms water.

Point Delgada

From this point eastward to point Ruiva the coast forms a bay, with a shore of low cliffs. At $\frac{2}{3}$ of a mile S. of Delgada point, and on the sea-shore, is the village of the same name, off which are several rocks, always uncovered, extending to seaward.

Coast.

Beyond this village is a projecting point, and to the SE. of this a rocky islet, close inshore, and nearly midway between the points of Ruiva and Delgada. About 325 yards ESE. of the islet is a sunken rock, where the sea generally breaks. The depth of water close to it is 12 fathoms. The coast then forms two little bights, obstructed by rocky islets, which, however, do not extend more than $\frac{1}{3}$ of a mile off shore.

In the entire bay there are 20 fathoms at $\frac{1}{2}$ mile from shore, and there are no dangers at that distance.

Ruiva, the NE. point of Flores, is high, steep, and broken. Several detached rocks lie at its foot, and one of them, E. of the point and 100 feet high, is called the Sugarloaf, or Bottle rock. Anchorage may be taken abreast this islet, but W. of the point, in 22 fathoms water, sand. This anchorage is sheltered from winds from SE. to WNW. through S., and it is chiefly used by vessels needing water, and forced by the winds to leave Santa Cruz.

Point Ruiva.

Between the two points, Ruiva and Santa Cruz, the coast forms a shallow indentation, bordered by high lands, except in the vicinity of point Santa Cruz, where there are some rocks above water, the one farthest out being on the meridian of the point, and 306 yards from it. The coast is, indeed, fronted almost throughout by rocks, generally above water. The largest of these is the islet of Alvaro Rodriguez, in the northern part of the bight, and near the shore. In case of need, vessels can anchor ESE. of this islet, in 25 fathoms water, sand.

Coast.

A little southward of Santa Cruz point is the castle, and then the town of the same name, the latter being the place

Santa Cruz.

of greatest commercial importance in the island. This town is built on the sea-shore, on a rocky beach overlooked by Santa Cruz mountain, 700 feet high, which, with the peak of Casino, farther inland, marks the approach.

All the coast adjoining is fronted by rocks and islets, through which tortuous channels lead to the landing. Over the rocky bed the depth ranges from 5 to 7 fathoms, but at a distance of $\frac{1}{2}$ a mile from shore there is sand, or sand and coral bottom in 50 fathoms water, and the anchorage is rarely off the town, but S. of it.

Anchorage.

About 2 miles to southward of the town is the low, rocky point of Cabeiro, rising inland with a gentle slope. It is nearly on the parallel of the two peaks forming the Lomba da Vaca, which serve as a mark for it from seaward. The coast between this point and Santa Cruz forms a bay, with a shingle beach at the head, where a brook empties. In this bight is the best anchorage. There is no hidden danger in it, and anchorage may be taken in 19 fathoms water, sand, in line between the point and town, at about 1 mile from the latter. There is good anchorage in 32 fathoms on the meridian of the town, as well. Along the shores of the head of the bight are a few rocks. The anchorage is protected from winds from N. to SW. through W.

Soundings.

The bank of soundings off this bight extends about 2 miles out. At its edge the lead gives 184 fathoms water, sand and coral. The depth thence decreases quite regularly toward shore. At $1\frac{1}{2}$ miles there are 81 fathoms, at $\frac{1}{2}$ a mile 32 fathoms, and at $\frac{1}{3}$ of a mile 10 fathoms.

Coast.

At $1\frac{1}{4}$ miles southward of Cabeiro is the high, steep point of Lomba, surmounted by the church of Boa Vista, which serves as a mark for it. In the northern part of the bay, between, is a little sand-beach, where a rivulet empties. Vessels can anchor over a sandy bottom in this bay in 22 fathoms, but it is less sheltered than the Santa Cruz anchorage.

From Lomba to Lagens, the SE. point of the island, the coast is formed of high bluffs, and between these two there is Capitão point, with a few rocks at its foot.

Point Lagens is high and steep, and a bank of rocks extends for 306 yards from its base to SE. The cliffs here are much broken. The town of Lagens is a little W. of the

point, on a hill-side, and its church is prominent and easily distinguished from seaward.

Between the points of Capitão and Lagens is a little bight, into the southern part of which a brook empties. This bight is well sheltered from winds from N. to WSW. through W., and vessels can anchor in 17 fathoms water, sand, with Lagens church bearing W. 10° S., and point Capitão N. 70° W., or they may let go in 22 to 28 fathoms, 1 mile from the shore. The approach is perfectly clear from N., E., or S., but in coming from the SW. care must be taken to clear Escolar rock, on which there are only $4\frac{1}{2}$ fathoms water.

Lagens anchorage.

The rock or shoal of Escolar is about 325 yards in diameter, and the water over it takes a whitish hue, easily seen in approaching it. The channel between it and the coast is about $\frac{1}{2}$ a mile wide and very deep. The rock is steep-to, and the depth of water around it is from 30 to 50 fathoms.

Escolar rock.

To clear Escolar rock in coming from the westward, wishing to pass N. of it, keep along the coast of Flores at a distance of $\frac{1}{2}$ a mile, or a little less. To pass S. of it, give the coast an offing of at least 2 miles until on the meridian of the church of Lagens, from which this rock is distant $1\frac{1}{2}$ miles.

From Lagens point to Rocha Alta the S. coast of Flores rises gradually, and is formed of cliffs rising in places perpendicularly from the sea. All dangers are apparent and close inshore. Point Lope Vaz is the southernmost point of the island, though but slightly projecting. It is low near the sea, but is high and steep at some distance from the shore. To the W. of this is point Rocha Alta, high, brown, and of perpendicular cliffs. On its summit are three peaks, the middle and highest one being 2,018 feet high.

Coast.

Point Ilheos de Agua Caliente, or, as it is usually called, Ilheos, is low and rocky. It takes its name from the hot mineral springs near it. The point terminates in a ledge of rocks extending S. and W. for something less than $\frac{1}{3}$ of a mile.

Between the points of Rocha Alta and Ilheos this ledge of rocks borders the coast, nowhere extending out more than $\frac{1}{3}$ of a mile. It is steep-to, and there are 5 to 11 fathoms water at its edge.

Ilheos anchor- Vessels can anchor opposite the little bay N. of point
age. Ilheos in 23 fathoms water, sand, 1 mile W. by N. from the
point.

Laranjeira Laranjeira shoal is a rock $\frac{1}{3}$ of a mile in diameter, in 11
shoal. fathoms water, with depths around it of 13 to 30 fathoms.
The channel between it and the coast, $1\frac{1}{2}$ miles wide, is clean
and safe, the depth ranging from 15 to 30 fathoms, over a
sandy bottom. The shoal itself is only dangerous in rough
weather.

Coast. North of Ilheos point is a slight indentation, where a
brook falls into the sea. The northern part of this bight,
off which is the anchorage above mentioned, is overlooked
by the peak of João Martin, 1,082 feet high. About 1 mile
farther N. is the low point of Cantarinhas, just off which
there is a remarkable islet of the same name. The coast
between these points is formed of cliffs which are very
broken, and off the points of the clefts are a few rocks.

Beyond Cantarinhas there are several little bights, ob-
structed by rocks, and then comes the high, steep, whitish
point of Bredos. One of the islets near this point is in the
shape of a column, and a sand-beach S. of the point is a
good mark for it.

Cantarinhas The indentation of the coast N. of Cantarinhas point has
bay. been given the name of Cantarinhas bay. Here there is
good anchorage, over a sandy bottom, in 22 fathoms water,
 $\frac{1}{2}$ a mile from the shore, with Cantarinhas islet bearing S.
by E. $\frac{1}{2}$ E.

Two rivers empty into this bay. They are the outlets of
a lake in the interior, S. of the peak of Caboco, and one of
them, the Ribiera Grande, forms a fine cascade.

Coast. From Bredos point the coast extends northward, with a
slight curve to Baxio point, with a beach almost the entire
distance. Near Bredos, a short distance in the interior and
on the steep western slope of the peak of Caboco, is the
village of Fajem Grande, and $\frac{1}{2}$ a mile N. of the same point
empties a river which is an outlet of the lakes on the cen-
tral plateau of the island between the mountains of Caboco
and Morro Grande. The coast here is low and sandy.

On the low rounded point of Baxio is the village of Fa-
jemzinha, connected with Fajem Grande by a road that fol-
lows the shore. In rear of the beach the coast is steep.

The portion of the coast just described forms the bay of Cantario bay. There is good anchorage in 25 to 30 fathoms water, sand, from which depths the soundings gradually decrease to 7 fathoms near the beach, with frequent rocky patches, so that care is necessary in letting go. There are 25 fathoms about 1 mile from shore.

There are a few rocks close to the base of Baxio point, and on the N. side of it there is a cleft which forms a little inlet or port, extending as far as the village of Fajemzinha. Near the point is a remarkable church, dedicated to St. Peter.

After Baxio point comes the low point of Fanaes, backed by steep blackish heights. A few rocks lie near its base, and at 1 mile N. $\frac{3}{4}$ W. of it is the island of Monchique island, 110 feet high. In the channel between it and the point there are 10 to 14 fathoms water, and vessels should pass close to the island, as it is steep to.

At $\frac{1}{2}$ a mile SE. by E. from Monchique is a smaller, low islet, named Baxio Raza, prolonged to southeastward by a ledge of covered rocks. Between this islet and the coast there is a boat-channel with 6 fathoms water. The channel between Baxio Raza and Monchique is safe.

The slight indentation between points Baxio and Fanaes is called San Pedro bay. Rocks lie all along its shores. Vessels can anchor off it in 20 to 30 fathoms water, sand, and about the middle of it there is a cascade formed by a brook which rises in the high lands of the interior.

Point Albernas, the NW. point of the island, is steep, of reddish color, and 270 feet high, with rocks lying off its foot. Between it and Fanaes point the coast forms a bight with shores of high cliffs, and about midway between the two points is Gadella islet, nearly circular in form, 520 feet high, and connected with the shore by a ledge of rocks. Anchorage may be taken W. of the islet in 32 to 40 fathoms water, sand or gravel.

Between Albernas and Delgada points the coast is clean and safe and is formed of high cliffs.

The bank of soundings surrounding Flores follows with considerable regularity the contour of the coast and is widest N. of the island, where it forms a tolerably sharp point. From 200 fathoms 5 miles N. of point Delgada, the depth diminishes rapidly to 100 and then gradually to 21 fathoms near

the point. A like rule holds good everywhere around the island, the slope from 100 to 200 fathoms being rapid, and inside of 100 fathoms more or less gradual, according to the width of the bank.

The bottom is generally of sand, and sometimes of rock or sand and coral. The shoals of Laranjeira and Escolar are the only dangers not close inshore; but the rocky patches must be avoided in letting go, and on this account it is better to anchor always at least 1 mile from shore, where foul ground is more rarely found.

From what has preceded it may be seen that the anchorages of Corvo and Flores, being in open roadsteads, are easily taken, but are not well sheltered.

Tides.

The time of high water, full and change, in these islands is 12h. 20m., and the rise 4 feet. The general current about these islands, which are 120 miles from the central group, sets ordinarily between S. and SW., with a velocity varying in proportion to the force of the wind, from 6 to 20 miles a day. The channel between them and Fayal is perfectly safe as far as is known, and is the preferable one to use in crossing the Archipelago.

GRACIOSA.

Aspect.

Graciosa, the northern island of the central group, is, after Corvo, the smallest island of the archipelago; it is the most fertile of all, and derives its name from its pleasing appearance. It is extremely mountainous, particularly in the southern part. In the SW. the highest mountain, Pedro Botelho, is 1,378 feet high. In the SE. a group named the Caldeira, 1,349 feet high, forms, like the Caldeira of Corvo, an elliptical space or valley, the plain of which is dotted with hillocks. One of the latter, broken by a deep crevasse, is named Forno. A lake in the NE. part of the plain is 388 feet above the sea, and the rise from the plain to the mountain crests is almost perpendicular.

In the eastern part of the island a group named Serro de Facho rises W. of the town of Praya to the height of 1,226 feet.

The NW. point is not so high, though a number of peaks rise irregularly along the coast and in the interior, so that Graciosa can usually be recognized at a great distance.

The island produces barley, wheat, maize, wine, fruits and vegetables of all kinds. Of sheep, hogs, and fowls the inhabitants have more than they can consume. The only scarce article is wood, for this is obtained from San Jorge and Pico. The inhabitants are distributed in two towns, Praya and Santa Cruz, and several villages, the capital of the island being Santa Cruz. Resources.

Between Graciosa and San Jorge there is a deep, safe channel 20 miles wide, running NW. by W. and SE. by E.; and between it and Terceira the channel is also safe and 30 miles wide. Channels.

Point Carapacho, the SE. point of the island, is low toward the sea, but high and craggy at a little distance inland. To the S. and E. the point is prolonged by ledges of rock, partly covered, and the sand-beach to westward of the point is fronted by rocks, some of them lying a considerable distance off. Carapacho point.

Point Sul, the S. point, is of high bluffs, and between it and Carapacho in one of the small bights formed by the coast, there are several mineral springs.

At $\frac{1}{3}$ of a mile S. 52° E. of Carapacho point there is a large oddly-shaped islet named Baxo. It is 450 yards long from SE. to NW., where it terminates in a sharp, high, conical point, while the SE. extremity is low, flat, and rounded. In this direction it is prolonged by a ledge partly covered, whose edge is marked by a small rock. Baxo islet.

NW. of Baxo and close to it is a second and much smaller islet, remarkable for its resemblance to a broken column. All the southern and western coast of Baxo is clean and steep-to.

There is a good channel between Carapacho point and Baxo, with 10 to 15 fathoms water, often used by vessels from the S. bound for Praya. It is necessary, in using this channel, to pass close to the islet, which may be approached within 1 cable without fear, to avoid a dangerous shoal patch about $\frac{1}{2}$ a mile to the westward. Channel.

This shoal is a rocky hummock, with only 7 feet water on it, in line between point Sul and the SE. point of Baxo, or W. 3° N. from the latter. It is also in line with Carapacho and Este points. There is deep water around it, (from 9 to 14 fathoms,) and the sea usually breaks on it. Shoal.

Therefore, to take this channel Este point should be kept at least 1 point open of Carapacho until on the parallel of the SE. point of Baxo. Sailing-vessels should not attempt this passage unless with a fair wind.

Coast.

Point Este, to the northward of Carapacho, is formed of cliffs rising from a shingle beach. Between the two is an inlet, at the head of which there is a sand-beach, where a brook empties. In the interior rise the heights of the Caldeira, and beyond Este point the coast gradually increases in height. Around this point there is a shoal extending out about 175 yards, with 3 to $3\frac{1}{2}$ fathoms water on it. Thence the coast is almost uniform and clear to point Fanais, which is of high, perpendicular cliffs. The coast between is of cliffs rising above a narrow beach of sand and shingle. At the base of the cliffs of point Fanais there are two rocks, just above water.

Praya bay.

Point Fanais is the southern point of Praya bay, which is only a slight indentation in the coast, fronted almost throughout by rocks, the only landing being at a small sand-beach in front of the town. Point Negra, low and round, is the northern limit. The town of Praya is built in a ravine where a brook flows to the sea, and along the shore to the southward of a vast bed of lava on the mountain side. South of the town the sand-beach at the foot of the cliffs is fronted by reefs extending out for 270 yards, at which distance there is a depth of more than 6 fathoms.

Praya islet.

About $\frac{1}{2}$ a mile E. of point Negra is Praya islet, low on the W. side but rather higher on the E., so that from SSE. it looks like a wedge. It is surrounded by reefs and rocks, many of which are submarine, and the depth of water on the shoals around it varies from $1\frac{1}{4}$ to 4 fathoms. Beyond this shoal-bank and E. of the S. point of the islet is a head of rock with 4 feet water on it. It is about 500 yards from the point, and has from 6 to 14 fathoms water close to it.

Channel.

The channel between Praya islet and the coast is tolerably safe, the depths ranging from 7 to 11 fathoms. In using it a vessel should keep in mid-channel, keeping point Fanais bearing S. 19° E. or in line with Baxo islet; the bottom is partly of rock, partly gravel.

Anchorage.

It is easy to make the anchorage of Praya from any direction. The best place to anchor is about $\frac{1}{3}$ of a mile S. of

the island and opposite the town in 10 to 12 fathoms. Vessels here, however, are only protected from winds from W. to S.

The time of high water, full and change, is 12h.15m., and the rise is 4 feet. Tides.

The bank of soundings is 1 mile wide at point Fanais, and 2 miles abreast the town of Praya.

From Negra point the coast runs almost in a straight line to point Santa Catharina, with only a few little bights and slightly-projecting points. The first of these bights is just N. of point Negra, and a larger one is N. of Santa Catharina. Between these points a few rocks lie along the coast, and rising above the cliffs is seen the peak of Aquilhino, 1,172 feet high, the easternmost peak of the Serro de Facho. Coast.

After Santa Catharina comes point Ferreira or José Ferrer, which is 3 miles NNW. of point Negra. It is very low, being even with the water, and is prolonged for 2 cables to N. and E. by a dangerous shoal, some of the rocks being above water. The depth of water at the edge of the bank is variable, being from 7 to 17 fathoms.

Santa Cruz, the capital of this island, is on the low shore of a bight, W. of point Ferreira; it is of considerable size and of some commercial importance, but has no anchorage in its immediate vicinity. Close to the town, on the SW. side, are three small hills near each other, and a church is on the highest part of every one of them; these, therefore, are good marks for the N. part of the island. Santa Cruz.

The best anchorage about the island is off the southern extremity of a great slope of land extending toward the point of Ferreira, in 30 to 40 fathoms, sandy-bottom, with Baxo islet in line with the western part of Praya islet, or a little open. Here vessels load and unload, and are ready to be off with any winds, but they lie sheltered only from S. by the W. nearly to N. All the goods from Santa Cruz are brought to this anchorage to be shipped. The tides are the same as at Praya. Anchorage.

From Praya the bank of soundings widens, and abreast Ferreira point its limit is 3 miles from shore; then it narrows, and is about 2 miles wide at Santa Cruz and along the NE. coast. Soundings.

From Ferreira to Vermelha point the coast runs north-westward in almost a straight line, broken, however, by the Coast.

bay on which Santa Cruz is situated. A few rocks lie off point Vermelha. Thence the coast curves to the westward to point Pico Negra, the north point of the island; it is high, oblique and of a very black color, and has reefs about its base; a few islets, quite near the coast, can be distinguished when NW. or SW. of them.

Thence to point Fogo do Porto, the western point of Graciosa, the coast continues high and rocky with here and there a shallow bight, in one of which is a sand-beach. A shoal $\frac{1}{3}$ of a mile wide extends all along, the depth ranging from 2 to 5 fathoms, while breakers mark the shoaler spots.

Gomez bay.

Point Fogo do Porto is a double point, the projections being separated by a little inlet completely obstructed by rocks. South of the second projection is Gomez bay, nearly circular in shape, and surrounded by cliffs with rocks lying along their base. There is a tolerably good landing near point Gomez, the southern limit of the bay, in which the soundings vary from 3 to 4 fathoms. The anchorage is outside of the bight, a little less than a mile from shore, in 15 fathoms water, coral bottom.

Coast.

Point Gomez is low and rocky, with a brook near it, and is at the base of a conical hill, about 515 feet high, named Vermelho.

From this point the coast gradually rises and describes a slight curve, concave at first, and convex after reaching the village of Esperanza, about midway between Gomez and Branca points. A little S. of Esperanza is a very high point, named Frades, and just beyond this are the highest cliffs of the entire coast. North of point Branca, which is very high and sloping, is Pedro Botelho, 1,378 feet high, the highest mountain in the island.

Between Branca and Fogo point, low and rocky, the coast forms a deep bight, the cliffs gradually diminishing in height. The shores at the bottom of the bight are fronted by rocks, the largest of which is named Forte islet. Near this islet there is good landing. A brook, which empties near point Fogo, rises in the interior and passes through the village of Luz, on the western slope of the Caldeira, and nearly on the meridian of the point.

From point Fogo to Sul, the southern point, there are a

few unimportant bights. The coast is formed of cliffs of moderate height, and is safe and steep-to. Soundings.

The bank of soundings surrounding this island is of very irregular shape, and the depths, except NW. and W. of the island, diminish without regularity. The bottom is generally of sand or gravel, sometimes mixed with shells and coral, and there are many large patches of rock that must be avoided in letting go.

TERCEIRA.

Terceira, the seat of government of the Azores, is very populous, having two towns and seventeen villages. Angra, on the S. coast, is the capital, and Praya is on the bay of the same name on the E. coast. The island is fertile, pleasant, and healthy. The lava districts produce excellent wines, though not equal to those of Madeira and the Canaries. The land yields large crops of wheat and other grain, pasture for cattle, and all those fruits of hot and cold climates which are propagated to the greatest advantage in temperate countries, but chiefly lemons and oranges. Vegetables also are abundant, especially potatoes. All kinds of cattle are cheap. Fish are plenty and of good quality, and water and wood abound. Aspect.

The coasts are high and so surrounded with craggy rocks as to render the island almost impregnable, every accessible part being defended by batteries. The eastern and central portions of the island are moderately high, and the western portion very much more so. Of an eminently volcanic nature, the island presents the most incongruous combinations of surface. Vast beds of lava appear on the N. and S. slopes of the central range, and in those parts particularly vines and fruits are cultivated.

In the SE. part is a high and almost circular plateau, nearly 4 miles in diameter. It is surrounded by a belt of mountains, steep to the southward, but sloping gradually on the NE. side. Its eastern boundary is a range named Lomba da Praya, whose 2 principal peaks are 1,842 and 1,662 feet high, and its southern boundary a chain, whose highest peaks are Piedras, 1,312, and Verde, 1,034 feet high. Its northwestern limit is formed by the heights of

the central Caldeira, whose southern faces fall in rapid slopes toward Angra, 2,036 feet below.

The summits of the central Caldeira form an elliptical plain, decreasing in elevation toward the N. to the foot of the high mountains of the center of the island. Among these latter the peaks of Agudo, 2,650, and Norte, 2,683 feet high, are the most remarkable. This chain rises sharply from the central Caldeira, and falls more gradually on the eastern and northern sides to the sea.

In the western part is the Caldeira de Santa Barbara or the Serreta, separated from the preceding by a deep valley, which completely isolates it. There are several craters of volcanoes and a few lakes on the plateau formed by the summit of this mountain. The chief peaks are one on the S. 3,500 feet high and one on the NE. 3,435 feet.

Many volcanoes and secondary peaks disseminated over the surface of the island will be mentioned in describing the coasts.

Mount Brazil, 555 feet high, is on a peninsula nearly in the middle of the S. coast, which shelters Angra bay on the W. It rises perpendicularly from the sea, and falls in a rapid slope on the N. to the citadel of San João, the principal defense of Angra, which is on a plain opposite. The summit has the circular form so often found in the mountains of the Azores, called Caldeira, a name given to the craters of extinct or inactive volcanoes. A watch-tower is on the eastern side of the summit.

Angra road-
stead.

The roadstead of Angra, in the bay of the same name, which is limited on the E. by point Val, is between the fortresses of San Sebastian and San Antonio. The latter is the outer fort at the base of the mountain, and the former is on the first point in the bay. The town and mole are at the head of the bay, and landing is not always easy. Merchant vessels generally anchor in 11 to 13 fathoms water, sand, on the line joining the two forts above mentioned, or farther in, in 7 to 9 fathoms.

There is no difficulty in making this roadstead, and both shores of the bay are clean and safe, but the ground at the entrance is foul, so that it is dangerous to anchor outside. The soundings in the bay are very regular, diminishing gradually from 22 at the entrance to 3 or 4 fathoms near the

town. The bottom is generally of sand, but there are patches of rock to avoid in letting go.

Merchant vessels at the above anchorage moor with two or four anchors. This is necessary as they are exposed to wind and sea from E. to SW. through S., and during such winds cannot get under way. In winter particularly the winds are violent, so that vessels are sometimes driven on shore in spite of all precautions. The pilots are directed to examine carefully the anchors and cables of vessels they take in, and to see that at least one anchor and its chain are larger than the dimensions of the ship would ordinarily require. Anchorages.

Men-of-war and large vessels commonly anchor farther out or about $1\frac{1}{2}$ miles E. of the S. point of mount Brazil. They should always be ready to weigh with the commencement of the easterly or southerly winds.

Angra bay is therefore an unsafe anchorage, especially in winter; from June to September, however, it is good, as the prevailing winds at this season are from W. to NW., and moderate. Refreshments are cheap and plenty and vessels may procure them at the entrance of the bay from the native boats, without anchoring.

When the SE. wind and sea are so strong as to make it dangerous to enter, a large *red* and *white* pennant is hoisted on the custom-house wharf and at point San Antonio, to warn vessels to remain outside until the weather moderates. As during these gales the crews of vessels at anchor can be of no service on board, if the anchors have chain-cables, and as the heavy sea often makes it impossible for boats to render any assistance, it is well to land the crews as soon as the *red* flag is hoisted on point San Antonio. Signals.

In approaching from the SW., S., or SE., steer directly for mount Brazil. Should the wind be adverse in approaching the land, tack boldly without the bay, as there is a sufficient depth up to the shore. But beware of a calm, as the currents are very strong and variable. If E. of the mountain and the breeze is light or it falls calm anchor when a convenient depth is found. If W. of it, if there is not a leading wind when sailing up toward the mountain, avoid too near an approach to the coast, as it would, in a calm, be attended with the utmost danger; the coast being iron-bound, a ship driven on it would be in a most perilous situation. Directions.

Tides. The time of high water, full and change, is 12h. 32m., and the rise is 4 feet. The flood sets in to the NW. and the ebb to the SE. and SSE.; and sometimes to ESE. along the N. shore of the bay.

Port Pipas. On the western side of the castle of San Sebastian is a little beach slightly sheltered by a wall of the castle. It is called port Pipas and is the spot where fishing-vessels are secured by grounding them on the sand. It also serves as a landing-place when the sea does not allow of landing at the mole. It is sometimes easier to land on the rocks under the cliffs on the western side of the bay; this spot is marked by a foot-path of difficult ascent.

Coast. From the castle of San Sebastian the coast is formed of cliffs, and runs northward as far as the mouth of a brook, off which are a few rocks. Thence it trends eastward to point Val. From this point to point Contiendas, the SE. point of the island, there are a few bights and slightly projecting points, with occasional small sand-beaches.

The first of these intermediate points is San Pedro, with the village of the same name a little in the interior, and on the western slope of the peak of Piedras; then comes Feteira and the village of the same name on mount Verde, and farther to the eastward is port Judea, a little bight at the mouth of a rivulet, along which the village of Judea is built.

Point Contiendas is low and salient, and is crowned by three little peaks; the two principal ones, Mina and Contiendas, are 493 feet high, and W. of the latter there is a landing-place.

Cabras islets. About midway between mount Brazil and point Contiendas, and at $\frac{2}{3}$ of a mile from the nearest part of the coast, are the two Cabras islets. The eastern islet is the largest and highest, (480 feet.) On the S. and W. it rises perpendicularly from the sea, and seen from E. or W. it appears like a wedge. Between the islets is a boat-channel about 220 yards wide, with 8 to 10 fathoms water in it; and between them and the coast any ship may pass, as there are 9 to 23 fathoms water, with sandy bottom and rocks near shore only.

Frades islets. The two Frades islets are about 2 miles SE. $\frac{1}{2}$ E. from the larger Cabras islet, and the highest is 30 feet high; it is of pyramidal form and has several little peaks, which at

a distance look like a cluster of rocks. There are from 4 to 20 fathoms water close alongside these islets, and ships may pass between them and the Cabras, the depths being 60 to 75 fathoms, gravelly bottom and clear ground.

At $1\frac{2}{3}$ miles E. $\frac{1}{2}$ N. from the larger of the Frades is an isolated head of rock, with 28 fathoms water on it; it is on the meridian of Contiendas point, and it is well to avoid passing over it when the sea is very heavy. This may be done by keeping in one the S. points of the large Cabras and mount Brazil.

Frades shoal.

North of Contiendas, the coast forms a small semicircular bight, of which the high, steep point Mina is the northern limit. At the end of the point are four large rocks or islets, and inside of it is a hill about the same height as the peaks of Contiendas.

Coast.

Between the points of Mina and San Jorge, low and surmounted by a battery, the coast forms the bight of Porto Novo, recognizable by the peak of Cruz, 715 feet high, just N. of the village of San Sebastian. A brook flows through the valley N. of this peak, and near its mouth is a landing-place, but the anchorage in the bight is very bad.

Porto Novo.

From point San Jorge, at the foot of the peak of Capitão, 487 feet high, to point Baxios, the coast is moderately high, and off the latter point are some rocks, on which the sea breaks when there is any wind. Close to these rocks there are 6 to 12 fathoms water, and at $\frac{1}{4}$ of a mile from the point 15 or 16 fathoms. In heavy weather the prolongation of this ledge under water causes the sea to break at some distance from the point, and at such times it should be given a wide berth.

After point Baxios comes point Santa Catharina, moderately high, and with a fort on it; this is the southern limit of Praya bay, the northern limit being point Malmerendo, high, steep, projecting, and terminating in a reef, near the end of which is a rock, covered at high water.

Praya bay

Praya bay, the best in the island, and one of the safest in the Azores with westerly winds, has the form of a crescent. It is about 1 mile across from fort Santa Catharina on the S. to fort Santa Espirito on the N., and its shore is a fine beach, defended in the northern part by batteries. Fort Porto is opposite the town, on a tongue of sand that protects a little inlet, called the port, from SE. and S. winds.

TERCEIRA.

The water here is only a few feet deep, and the inlet is used only by the native craft.

Praya.

Praya is a fine and regularly-laid-out town along the little port in the northern part of the bay. Along the sea it is protected by a wall extending between the forts of Luz, Chagas, San João, San Antonio, and San Caëtano, the latter being on a sandy knoll on the right bank of the most northerly water-course that empties into the bay. A few black rocks lie about the beach just N. of this fort, and others show near fort Chagas, a little S. of the town.

South of fort San Caëtano a river of the same name flows into the bay, where it forms quite an extensive marsh, which terminates at fort San José, W. of fort Santa Catharina.

Cabo da Praya.

The village of Cabo da Praya is a short distance S. of fort San José, and near it a third stream falls into the bay. A road along the shore inside of the fortifications connects it with Praya. A hill named Faves rises E. of the village.

Directio

The best mark for Praya bay is the range with the high peaks of Norte and Agudo, the southern part of which is nearly on the parallel of the town. This latter is in a valley formed by the Lomba da Praya on the SW. and some heights along the shore to the NE., and this valley extends to NW. across the island to Villa Nova, on the N. coast.

The bay is free from any hidden danger, and is easy to make. The bottom is sand, good holding-ground. Vessels are sheltered from winds from N. to S. through W., but exposed to all others, and the easterly winds are rather to be dreaded, so that a ship should put to sea at the commencement of on-shore winds. The best anchorage is with Malmerendo point in line with Carneiros islet, 3 miles N. 25° W. of it, and with the two steeples of the town in line, in about 25 fathoms.

Boats should not attempt to land in the southern part of the bay, as they will ground on a bank there before reaching the beach. The proper landing, and a convenient one, is in the port. During the fine season, from June to September, the winds are generally light and from the westward, so that then vessels can anchor farther inside, SE. of the town, in 7 to 16 fathoms.

Soundings.

Abreast the bay the bank of soundings extends out for 7 miles, at which distance there are 220 fathoms, diminishing rapidly to 90 fathoms, and then gradually to the shore.

Thus at 3 miles there are 50 fathoms, at $1\frac{1}{2}$ miles 28, at 1 mile 18, and at $\frac{1}{2}$ a mile 9 or 10 fathoms. The bottom is generally of sand, with frequent rocky patches.

The time of high water, full and change, is 12h. 35m., and the rise is about 4 feet. Tides.

As at Angra, provisions, &c., can be obtained from boats without the bay.

From Malmerendo point the coast sweeps to northward and westward to Carneiros point, and is formed of high inaccessible cliffs. About NNW. from the latter point is the islet of the same name, 62 feet high, and about 550 yards N. of point Carneiros is a shoal. The islet is steep-to, and between it and the coast is a clear channel $\frac{1}{2}$ a mile wide, with 12 to 17 fathoms water in it. Carneiros islet.

From point Carneiros to Rua Longa, the northernmost point of the island, the coast is indented by several bays, but it is inaccessible throughout, and is fronted by rocks and reefs, so that an offing of at least 1 mile should be kept in sailing along it.

West of point Espartal the coast forms two considerable bays. Off the first, and at $\frac{2}{3}$ of a mile from the coast, is a patch of isolated low rocks known as Villa Nova rock, with 6 fathoms water just E. of it, and 9 fathoms W. of it. There is a boat-channel between it and the coast. Villa Nova rock.

At the head of the second bight is the village of Villa Nova, and there is a landing-place between the village and the point of the same name on the western shore of the bay. Off the point there are a few rocks.

Between Villa Nova and Alagoa points the coast presents a wavy outline, and is formed of continuous cliffs whose base is fronted by rocks. The latter point is high, bluff, and quite salient. Coast.

Thence to point Mysterio several little bights are formed. Point Mysterio itself appears, from several directions, to terminate in a low bluff, surmounted by an irregularly conical rock, and a little beyond it is a good-sized but inaccessible bay which takes its name from the borough of Santa Beatrice, at its head.

The coast-line is then irregular to point Rua Longa, which is low and slightly projecting, and on which is the village of San Pedro. In the interior and a little to the westward of the point is the regular, conical peak of Vianna,

rising above a vast lava-bed, which, commencing near the center of the island, extends to the sea-coast. There is a landing in a bight W. of point Rua Longa.

From this point the coast sweeps in a curve convex to N W., to Serreta point, and is formed of moderately high cliffs. The only noticeable point in this extent is the peak of Pinto, which is the half of a conical hill, the other half having been carried away by the sea. It is high, and the sea-face falls perpendicularly, and near it is the village of San Bento. Negrita point is a little NE. of Serreta, and both of them are covered with scorïæ and streams of lava from the volcanic peak of Nigrao to the eastward. Serreta point projects for $\frac{1}{2}$ a mile to seaward, so that a bight is formed on either side.

Serreta rocks. At about 2 miles from the extremity of point Serreta, between the bearings of N. 51° W. and N. 56° W., there are two very dangerous rocks named the Serreta, with only $1\frac{1}{2}$ fathoms water on them. Though these dangers are separated by a narrow channel, they are both on a shoal-patch, where the depth ranges from 10 to 18 fathoms, between which and the shore there is a deep channel more than 1 mile wide.

Caution. Near the Serreta rocks the soundings are both great and variable, giving little warning of proximity to these dangers; so that great care is necessary unless the sea is breaking on them. To avoid them vessels should pass (if inside them) $\frac{2}{3}$ of a mile from the point on a NE. or SW. course, but it is better to pass outside, keeping an offing of about 5 miles. The rocks are in line with Serreta point and the middle of the Caldeira of Santa Barbara, and in going S. a vessel has cleared them when the peak of Nigrao is in line with the point, and in going N. when this peak is in line with Negrita point, or the middle of the Caldeira.

Coast. Between point Serreta and the peak of the same name, 1,090 feet high, the coast forms a shallow bight, and a little way inland is the village of Serreta. Between the points of Serreta and San Matheo, on the S. coast, the coast is inaccessible (except one small landing E. of Ribeiras point,) and should not be approached too closely.

Point San Matheo is the western limit of a bay terminated on the E. by mount Brazil. The town of Angra extends in part along its coast, which is low and safe, yet the bay is so

exposed that it is only frequented by the native craft. On its shores there are fine vineyards and gardens.

The bank of soundings around Terceira is generally wide, but very variable. On the NW. and SW., however, it is so narrow as to render an approach to this part of the coast quite dangerous. Soundings.

The bottom is variable as well, being chiefly sand, but often rock, coral, shells, and gravel. SE. and E. of the island it is generally of sand, but in the other parts the lead must always be taken as a guide in anchoring, as the changes are frequent and sudden.

SAN JORGE.

San Jorge is a long, narrow island, lying WNW. and ESE. It is 29 miles long from point Topo to point Rosales, and its average width is 3 miles, but the northwestern part is a narrow tongue terminating in a sharp point. The central portion is the highest. A mountain-range follows the direction of the island, and the highest peaks are Esperanza, 3,498 feet, and another NW. of it, 3,463 feet high. To N. and S. the slope is rapid to the sea. The central plateau is separated from one farther S. E. by a deep valley, through which a river flows. On this latter plateau are 3 peaks, of which the first is 3,068 feet; the second, Patalogos, 3,122 feet, and the third, Fojos, is 2,824 feet high; thence the land slopes gradually to SE., and near this extremity of the island several lesser mountains rise, the height of the greatest being 1,930 feet. Aspect.

In the narrow part of the island, to NNW., mountains form a crest, of which the highest peak is mount Trigo, which has an elevation of 1,685 feet.

In 1808 the volcano of Esperanza was in active eruption. The principal stream of lava took its direction toward the fine town of Ursula, which it seemed on the point of swallowing up, but suddenly changing its course it rushed into the sea by a different channel. Many hundred acres of fertile land were covered with scorïæ and ashes and some lives were lost.

The population is distributed among 3 boroughs and 7 villages, the southwestern part of the island being most thickly inhabited. Vines and grain of different kinds are

cultivated, and excellent cheese is made. Water and wood are abundant. The chief town is Vellas, on the SW. coast.

Channels.

Between Graciosa and Terceira on the N., and San Jorge on the S., there is a wide, deep, and clear channel, which presents few difficulties to navigation; indeed, the sole obstacle is the current, which is very variable in direction and much influenced by the tides.

The channel S. of this island, separating it from Pico and Fayal, is deep, clear, and 10 miles wide in its narrowest part. The current is quite strong, and follows the direction of the channel according to the tide. It is advised not to take this channel except in settled weather and with a fair wind, for the coasts of Pico and San Jorge are so steep that a calm becomes dangerous.

Topo islet.

Point Topo, at the eastern end of San Jorge, is tolerably high, and is surrounded by rocks, most of them above water. At $\frac{1}{2}$ a mile E. of the point is an islet of the same name, 60 feet high, nearly circular, and surrounded by reefs. The channel between it and the coast is only 380 yards wide, and right in the middle of it is a cluster of rocks. The depth of water is 6 to 7 fathoms, and it is not recommended as a safe channel for ships, though Tofiño says it is not dangerous. There is deep water near the islet on all sides except the S., where there is a shoal with 3 fathoms water over it.

Coast.

Between points Topo and Norte Grande the N. coast of San Jorge is formed of high cliffs, rising from a narrow, continuous line of beach. A few rocks, some of them above water, lie close inshore, but there are no other dangers. There are only a few unimportant indentations and some slightly projecting points until Norte Grande point is reached. This is high and prolonged under water by a ledge of rocks, which extends about 440 yards in every direction. It is nearly on the meridian of the peak of Esperanza, and there is a landing E. of it in the bight between it and Norte Pequeño. Dwellings line the road along the shore between these two points. Vessels can sail along shore, with an offing of 1 mile, without danger.

From Norte Grande to Gonzalvo point the coast is of high cliffs. There are a few shallow indentations, the most noticeable being just E. and W. of Furada point. Along the foot of the cliffs there is a sand-beach, and W. of point

Furada, and close to it, is a black rock. The point itself is quite high. W. of it a few little peaks rise above the cliffs, and near the first of them there is an inconsiderable town.

Point Gonzalvo is low and blunt. Two lines of superposed cliffs commence in its vicinity and extend westward to Norte point, low and slightly projecting. Thence the height of the cliffs gradually diminishes to point Rosales, the NW. point of the island.

All the line of coast above described is safe, as there are only small reefs close to it, but it is almost inaccessible.

Point Rosales is narrow, rounded, and moderately high. It is lower on the NE. than on the SW. side. It is prolonged for about $\frac{1}{2}$ a mile by a ledge of rocks, some of them submarine, and some that rise to the dignity of islets. Of these latter the two most remarkable are known as the Rosales islets, and are, one N. of the point and close to, and the other about $\frac{1}{6}$ of a mile WNW. from the point. The larger is 234 feet high. South of the point there is another islet, 232 feet high, named Rosalina rock.

Rosales islets.

Between Rosales point and the Morro Grande the coast is of moderate height, and is formed of perpendicular cliffs, crowned here and there by peaks of considerable size.

Coast.

The Morro Grande is a mountain somewhat similar in appearance to mount Brazil, of Terceira, nearly black in color, and with a watch-tower on its summit.

In proceeding SE. from Rosales point the first village seen is Ruiva, nearly on the meridian of the point of the same name. This point is remarkable from a peak which caps the cliffs, and a few rocks showing near its base.

Thence the coast curves slightly to form a bight, terminating at the point of Morro do Lemo, which is high, salient, and surmounted on its eastern part by the hill from which it takes its name.

Between the Morro do Lemo and Morro Grande there is a second unimportant bay, the shores of which are fronted by a few rocks. It is sometimes mistaken for Velas bay, which lies E. of the latter hill. Such a mistake should be carefully guarded against, for it is difficult to leave this bay with the same wind that carried the vessel in, and the anchorage is bad, the bottom rocky and foul. Through a like error several vessels have been lost.

Vellas bay. The anchorage of Vellas is between Morro Grande, on the W., and point Queimada, distant $1\frac{1}{2}$ miles, on the E. On the latter point is a little fort. It is protected from winds from NW. to ESE. through N. The head of the bay presents a line of tolerably high cliffs, forming near the town several points, near which are a few rocks. One of these points, at the SE. part of the town, protects a little bight, where the mole is situated, and inside of this there are 3 fathoms water, rocky bottom.

Anchorage. In approaching from any direction, steer for Morro Grande, and then anchor on the line joining the foot of this hill with Queimada point. Opposite the town, on this line, there are 9 fathoms water, fine black sand. This position is about midway between the two points, and the vessel is in position to clear either of them should a SE. or SW. wind, dangerous at this anchorage, set in.

There are few resources to be found here, and the anchorage is little frequented, except by the native craft.

Tides. The time of high water, full and change, at Vellas is 12h. 30m. The rise is from 4 to 5 feet.

Soundings. On the meridian of the town the bank of soundings is only about $\frac{1}{2}$ a mile wide, at which distance there are 133 fathoms, thence diminishing rapidly toward shore, so that at $\frac{1}{3}$ of a mile there are 76 fathoms, and 9 fathoms at 450 yards from shore. The bank is a little wider on the meridian of the Morro Grande, and much narrower on that of Queimada, where there are 264 fathoms at $\frac{1}{2}$ a mile from the coast. At $\frac{1}{6}$ of a mile there are 11 fathoms.

Between the points of Queimada and Monteiro, the southernmost point of San Jorge, the coast is low and fronted by rocks, but the lands of the interior are high. A road thickly strewn with dwellings follows the direction of the shore-line, which presents several indentations or shallow bays, most of them inaccessible.

Calheta creek. The village of Calheta is on the SE. slope of a mountain which rises behind the low point of Manadas. A reef along this part of the coast extends about 340 yards to seaward. The village is built along the shore, and the landing is in a little creek just E. of it, and $\frac{2}{3}$ of a mile from point Manadas. A considerable quantity of wood is shipped from here to the other islands.

Beyond Monteiro point the coast runs nearly in a straight

line to Morro, the SE. point of the island; it is high and steep, with a beach at its foot garnished with a few rocks.

Between point Morro and Pontinha point, the coast is of low cliffs. A little N. of the latter point is a little bight, known as the port of Topo, which is frequented by the native craft trading with the village of Topo.

The bank of soundings around the island of San Jorge follows nearly the direction of the coast-line; it is generally very narrow and is particularly so in the NW. part and along the southern coast, whence it follows that the currents of the channel between this island and Pico are dangerous in a calm, for the bank of soundings along the northern coast of Pico is even narrower than this, and it is difficult for a vessel drifting on the coast to anchor in time to avoid shipwreck. Soundings.

From Rosales point the bank extends $3\frac{2}{3}$ miles to WSW. in a narrow tongue; at this distance there are 145 fathoms, and at 2 miles farther W. 220 fathoms. From this limit the soundings diminish regularly to the point, but in running for the point a vessel should not get within 25 fathoms, or about 1 mile, so as to avoid the ledge which prolongs the point for $\frac{1}{2}$ a mile to seaward. The outer part of the reef breaks in heavy weather, but at other times it is not dangerous.

The 100-fathom line passes $1\frac{1}{2}$ miles S. of point Rosales, and the depths inside it are very irregular. Thence it nears the coast more and more, passing Morro Grande at a distance of $\frac{1}{2}$ a mile. Thence to point Manadas the bank is only a narrow band, and there is deep water close inshore, sometimes as much as 90 fathoms, so that a good offing should be kept unless with a steady wind. From point Manadas to point Monteiro the bank grows irregularly wider, and the 100-fathom line is generally from $\frac{2}{3}$ of a mile to 1 mile from the coast; the depths are generally considerable, close inshore.

Between the points of Monteiro and Morro 200 fathoms are found about $1\frac{1}{2}$ miles off shore, but the depths are irregular. The bottom of the entire bank is ordinarily of sand or rock.

PICO.

Pico, which takes its name from the highest mountain of the archipelago, (7,613 feet high,) is irregularly shaped, Aspect.

being wide and rounded to WNW., and narrow to ESE. Though all the island is high, the western part is the highest and is almost completely occupied by the mountain of Pico. This mountain is of tolerably regular conical shape, truncated near the top, so that the edge seems a right line inclining slightly to the E., and from the middle of the plateau thus formed rises a very sharp regular conical peak. From its base for about half its height it is covered with vines and orange groves; for the next quarter it is covered with bushes, and the upper part is of bare rock and patches of grass. The ascent even of the sugar-loaf is possible. The peak has been described as filled with dark volcanic caverns, which have frequently emitted smoke, flames, and ashes to a considerable distance. At the foot of the mountain toward the E. is a spring of fresh water, generally cold, but sometimes so heated by the subterraneous fire as to rush out in torrents in a boiling state, and send forth a stream of sulphurous vapors, vitrified stones, &c. In clear weather the peak can be seen 72 miles and even a greater distance. The southern face is quite steep, but the northern slopes more gradually.

Many secondary heights lie W. of the peak and line the W. coast of the island; among them the peaks of Cabeza Grande, Cabeza das Casas, Cabezo Brabo, Agoa do Pao, Serra Gorda, and Salado.

The central part of the island forms at the foot of the eastern slope of the peak a narrow plateau, which slopes rapidly to the sea on the N. and S. Its general direction is WNW. and ESE., and it occupies the central portion of the island to its eastern extremity. Several peaks rise from it less lofty the farther E. they are. The most lofty of these is Topo, 5,357 feet high, on the southern border of the plateau, and then in going E. the Caldeira de Santa Barbara, 3,500 feet; the peaks of Cabras, 2,634 feet; Lanza, 2,310 feet, and Sibado, 1,794 feet high.

The island shows many traces of volcanic eruptions. Seen from a long distance it appears like a single mountain rising directly from the sea.

Resources.

There are several towns and eleven villages in Pico. The soil, chiefly of pulverized lava, is not favorable for producing grain, and the greater part of the wheat and maize for consumption is imported from the neighboring islands.

Wine is the staple commodity, and is reputed the best in the Azores; this, with brandy made from the inferior wine, is exported in considerable quantities. Cattle are various, numerous, and excellent; and fruit is abundant and equally fine. Besides these there is cedar with other timber, including a beautiful kind of yew, called *Teixo*, which is remarkably solid and fine.

The SE. point of the island, which is rather low and sloping, is named point Ilha. South of the point there is a small inlet, named Calhao Gordo, where there is a landing. Coast.

Between Ilha and Calheta point to the westward, the coast is moderately high and forms several small bights frequented only by the native craft, which haul up on the beach. Near the latter point are two little islets.

Thence to point Negra the coast forms only shallow bays and slightly projecting points, behind which the lands of the interior rise in a sharp ascent. Near the brow of the cliffs a road lined on both sides with dwellings follows the direction of the coast.

Between the points of Negra and Ribeiras the coast forms a shallow bight, called Ribeiras bay. Into this a river empties, which drains the valley formed by the Caldeira of Santa Barbara and the mountains of Topo and San Paulo. The bay is only frequented by coasters belonging to the island. Ribeiras bay.

The village of Santa Barbara is 1 mile W. of Biscoito point, on the brow of the cliffs, at the foot of mount Topo. Biscoito point is wide and but slightly projecting.

Arrife, the S. point of the island, is surmounted at its extremity by a little conical hill, while just behind it rises the Cabeza de Granga, 1,461 feet high, formed of three summits, which can all be distinguished from the SSW., and beyond these again is the peak of Topo. Point Arrife is a blunt promontory with reefs near its base, and the western part, Castello point, is the southern extremity of Lagens bay.

The portion of coast above described is only frequented by coasting-vessels, as it offers no anchorage for large vessels. Soundings. The bank of soundings averages $\frac{1}{2}$ a mile in width; the bottom is generally of rock, and the soundings are great. At $\frac{2}{3}$ of a mile from the coast there are 200 to 225 fathoms. On the meridian of Arrife point the bank widens, and these

same soundings are found at a little more than 1 mile from the coast; the depths inside these are irregular, and the bottom is of rock, sand and coral.

Lagens bay and lagoon.

At point Castello the coast turns to the N. and is fronted by reefs, and then curves to the W. to Santa Catarina point, the western extremity of Lagens bay.

The town of Lagens is N. of Castello point, at the foot and on the western slope of the Cabeza de Granga. Here the coast is low and much broken, and one of the deepest indentations is called the lagoon of Lagens. There is a bar across the entrance, which may be crossed at high water, and it forms a little port, which the native craft use and where they are protected from the sea. All the coast near the town is fronted by rocks and islets, N. of which boats can land.

Coast.

Point Santa Catarina, low and rounded, is backed by high lands. There was a celebrated eruption in 1720 from the crater immediately in its rear.

From Santa Catarina to point San João the coast is almost a straight line, and is fronted by rocks and reefs. It is of rather low cliffs, and the only accessible point is off the village of San João.

San João, which is rather a bend in the coast-line than a point, is surmounted by two craters, between which passes the road that follows the coast around the entire island. In 1715 the northernmost of these craters caused great ravages in this part of the island by a violent eruption. A few rocks lie off the base of the point.

Beyond this point there is a little sand-beach where boats can land, and then follows the promontory and low point of San Mattheus, crowned by five hillocks, W. of which is the town of the same name.

Soundings.

Between the points of Arrife and San Mattheus the bank of soundings is even narrower than that above described to the eastward. Depths of 200 to 225 fathoms are found at $\frac{1}{2}$ a mile from the shore, and there is no available anchorage for large vessels. The bottom is chiefly of rock and sand.

Coast.

The so-called port of San Mattheus is off the village, 1 mile from the point. Thence to point Arcos on the N. shore the coast describes a nearly regular curve, convex to the Fayal channel. It is of low cliffs, and has but a few slightly projecting points and shallow indentations, which

can be used only by the native craft, and it is fronted throughout by rocks and shoals.

In the first part of this extent, between San Mattheus and Pé do Monte point, the coast is low and fronted by rocks. A little N. of the latter point is the hill of Monte, 242 feet high, and E. of it is the Cabeza das Casas.

The village of Candelaria, near point Espartel, and between it and Pé do Monte, is easily recognized by two towers standing close together.

Point Pé do Monte forms the southern limit of the Fayal channel on the E., while Baxio Grande is the northern limit. From the latter a ledge of rocks extends out about $\frac{1}{2}$ a mile, and in heavy weather breakers extend outward for nearly 3 miles, so that a good offing must be kept. Between these two points are the rocks and port of Magdalena, off the village of that name.

Port Magdalena is a little inlet on the W. coast, on the shore of which is the village. From this town the greater part of the produce of the island for exportation is shipped off for Fayal in small row-boats.

The Magdalena rocks are two islets more than $\frac{1}{2}$ a mile from the coast, and connected with it by a shoal. The southern islet is the larger. The smaller is a conical rock 236 feet high, and lies about 200 yards N. of the former. The large islet rises perpendicularly on the eastern side, has a nearly flat summit, and terminates on the W. in a sharp ridge and a low point. The western part is pierced by a circular grotto, plainly seen when the island bears S. These islets are steep-to on the W., where there are 7 to 12 fathoms water. On the shoal joining them to the coast there are $2\frac{1}{2}$ to 3 fathoms, and along its N. and S. edges 6 to 7 fathoms. On this shoal, and about $1\frac{1}{2}$ cables from Magdalena point, there is a rocky head where the sea breaks. All vessels should pass to westward of the islets.

From point Baxio Grande the coast trends to the eastward, and is low and little marked by points or bays, and, as before, it is fronted by rocks. The first point is Caes de Merato, then just beyond it Baxio Pequeño, after which is the port of Caxorro, a little bay, with a village on its shores, and then point Arcos, the northernmost point of the island.

At 1 mile E. of this is Cabrita point, with the village of

Santa Luzia a little in the interior. This village is W. of the low hill of Queimado, which rises nearly from the sea.

From point Cabrita to point Misterio, which is low, rounded, and prominent, the base of the coast is fronted by islets and reefs. Between these are the points of Queimada, N. of the hill above mentioned, and San Antonio, that shelters a little inlet where there is a landing. Near the latter is the village of the same name.

From point Misterio the lands rise gradually inland to a crater which was in activity in 1715. The eruption of that date is marked by a broad bed of lava and scoriæ.

Near San Antonio point is the little bight or landing named Caes do Pico, used by the native craft, and farther to SE. the village of San Roque, and still farther on Biscoitos point, crowned by a conical hill.

From point Misterio to point Lagido the coast is formed of low cliffs, the land then rising rapidly to the interior.

Canas bay.

South of the former point is Canas bay, a slight indentation, on the shore of which stands the village of the same name.

Coast.

A little beyond Canas bay is the low point of Vermelha, off which is a ledge of rocks, two of them above water. This ledge lies close off the point and is about 500 yards in extent NNE. and SSW. Thence the coast runs to eastward and southward to the large village of Prainha.

From Terra Alta point the cliffs are somewhat more lofty to Ribeirinha point, and at their base there is a sand-beach. About midway between these points there is a large rock a little off shore, named Rocha Alta. Ribeirinha point is low and fronted by a reef, which extends for about 350 yards to the westward.

Port Baxia.

Port Baxia is simply a shallow bight lying between the points of Lagido and Castellito, the latter crowned by a little hill 256 feet high. At a little distance in the interior is the village of Piedade, where there is a rather remarkable church.

To recapitulate, it may be stated that there is not a single fit anchorage for large vessels about the island of Pico. The coasts are generally inaccessible, and the bank of soundings is extremely narrow throughout, with very deep water and rocky bottom. There is, however, a considerable coasting

trade, and most of the produce of the island is sent to Horta, in Fayal.

The time of high water, full and change, at Pico is 12h. 30m., and the rise is $4\frac{1}{4}$ feet. Tides.

The channel between Pico and Fayal has been given the name of the latter island, and, as both islands are on the same bank of soundings, bottom can be found anywhere in the channel. In its narrowest part it is $3\frac{1}{3}$ miles wide. Fayal channel.

In the northern part of the channel the depth diminishes regularly from 54 fathoms in the middle to 30 fathoms at 1 mile from the coast of either island. Nearer the shore the soundings are irregular, but the Fayal side is the safer, for near Pico are, as already stated, the rollers off point Baxio Grande and the Magdalena rocks, which, notwithstanding their size, might be dangerous in thick weather or darkness. These are the only dangers in this portion of the channel. In the southern part the depths are more irregular, and greater than in the northern.

The only serious danger in the Fayal channel is Chapman rock, in the southern part. This is a rock covered with 4 fathoms water, the highest point of a small shoal with 9 to 10 fathoms on it. It appears to be the summit of a submarine mountain, and the depths increase so rapidly that the lead is an insufficient guide of its vicinity. The shoal is nearly $1\frac{1}{2}$ miles in length E. and W., and in westerly gales the sea breaks heavily on it. From this rock the following bearings have been taken: Espalamanca point, in Fayal, N. by E., distant $2\frac{1}{3}$ miles; cape Guia, N. 47° W., distant $1\frac{1}{2}$ miles; the chapel of Monte Guia, N. 37° W., and the higher Magdalena rock, E. 44° N., distant $2\frac{3}{4}$ miles. It is also in line between the southern extremity of Monte Guia and the peak of Monte, in Pico. Chapman rock

To avoid this shoal in coming from the S. in the day-time, keep point Espalamanca and point Ribeirinha, the NE. point of Fayal, in line until on the parallel of Guia mountain, when it will be cleared. Directions.

In coming from the N., after passing southward of Espalamanca point, keep on the above alignment until the peak of Monte in Pico bears E., when it will be cleared.

In coming from the SE. steer NW. $\frac{1}{2}$ W. for the chapel on Monte Guia, (which will take the vessel $\frac{1}{2}$ a mile S. of the shoal,) until on the alignment as above.

In working through the channel, do not pass to eastward of the line joining Espalamanca and João Dias points until to northward of the shoal, and do not approach the land too closely on account of the squalls and shifts of wind occasioned by it.

At night, if the points are not easily distinguished, keep along the shore of either island until the rock is cleared.

Soundings.

In mid-channel there is an irregularly-shaped pit, where there are 80 to 118 fathoms. The bottom in the northern part is of sand, shells, or gravel, with occasionally coral and scattered rocks. In the southern part it is nearly the same, but rocky patches are more frequent, especially near Pico and between Chapman rock and Guia mountain. Between Espalamanca point and the Magdalena rocks the sand of the bottom is only a light layer covering the rocks. The depths here also are considerable, and vessels should not anchor in this part.

Tides.

In the Fayal channel the flood sets to NE. with a velocity of $1\frac{1}{2}$ miles an hour, and the ebb to SW. It is well to profit by the tides in passing through. The time of high water is 12h. 22m., and the rise is $4\frac{1}{4}$ feet.

FAYAL.

Aspect.

Fayal is in the form of an irregular polygon, with a large appendage or promontory on the W. Its greatest length is 11 miles and its width $7\frac{1}{2}$ miles. Like all the others of the archipelago, this island is mountainous; the central portion is the highest, and from a distance it has the appearance of a truncated cone. The central height is a crater, girdling a considerable space, forming a Caldeira like those already described in the other islands. The bottom of this space or pit is a fine plain, dotted with hillocks, and in it is a lake fed by a number of small streams from the surrounding heights. The upper part is 1 mile in diameter, and at its southern edge rises the mountain of Pico Grande, 3,351 feet high.

From the foot of the Caldeira a chain commences and extends westward, diminishing in height as it approaches the shore. One of the mountains in this chain, the peak of Fogo, 1,857 feet high, was in eruption in 1662, and the traces are still seen. Farther W. the mountains of Fonte and Norte were in eruption in 1614 and 1145, respectively.

This island has been celebrated for its excellent pastures, fish, wood, &c. The air is always mild and pure; the cold of winter never felt, and the heat of summer always tempered by refreshing winds. The island produces wheat and maize sufficient for itself and a part of Pico. The cattle reared here are not sufficient for the consumption of the island, and supplies are therefore sent from the neighboring island of San Jorge. The annual produce of wine is also scanty. A considerable quantity is exported under the appellation of Fayal wine, but it is chiefly from Pico. Resources.

Fayal is the most frequented of all the islands after San Miguel, as it has one of the best harbors in the Azores, and lies directly in the track of vessels crossing the Atlantic. But little running water is found, so that many wells are used, which give water of excellent quality.

Cape Guia is the SE. point of the peninsula or mountain of the same name, S. of Horta bay. It is a perpendicular cliff, above which the land rises rapidly to the summit, on which is the chapel of Nostra Senhora da Guia, or Ermita. This summit is 487 feet high. At a few hundred yards northwestward from the chapel is the signal station. Cape Guia.

The eminence of Guia, the broken crater of an extinct volcano, forms a regular curve, convex to the N.; the SW. side is 340 feet high. The summit is a narrow, continuous plain, with several buildings on it. A road leads up the northern face, while the southern slope is very rapid, and the base of the hill on this side is indented with a figure-of-eight-shaped bight, named the Caldeira do Inferno, sheltered from all winds. Unfortunately the bottom is generally of rock. The depth of water in the inner basin is $1\frac{1}{2}$ to 5 fathoms. Caldeira do Inferno.

The E. point of entrance to the Caldeira, Inferno point, might easily be made to shelter an excellent port for boats. It is formed of three large rocky islets. The W. point, Caldeira, is 1 cable distant from the first, and nearly midway between them there is a rocky head with 3 fathoms over it. A breakwater from this rock to Caldeira point would shelter the basins, in the outer one of which there are 9 to 13 fathoms. From point Caldeira the coast trends to NW. and then W., to the W. point, named Ponta Oeste da Guia, the SE. extremity of Pim bay.

The mountain of Guia is connected with the main by a peninsula, low in its southern part, where it is called Entre Montes, and rising to a hill named Queimada, 268 feet high, in the N. There are fortifications on the brow of this hill, and point Queimada, at its base, is the southern limit of Horta bay.

Pim bay.

West of the peninsula is Pim bay, where small craft discharge cargo in fine weather, but it is completely exposed to SW. winds. The bottom is generally of rock, and the depth varies from 1 fathom near the beach to 12 fathoms at the entrance. The port of Pim is at the head of the bay, with depths of 1 to $2\frac{3}{4}$ fathoms. The coast at the foot of Guia hill is clean and safe, but the northern shore, (where can be seen a white house, a wind-mill, and Pim castle,) is fronted by rocks, and a shoal with 1 to $1\frac{1}{2}$ fathoms on it, which narrows the available part of the bay considerably. A good anchorage is $\frac{1}{3}$ of a mile W. of Ponta Oeste da Guia, in 17 to 19 fathoms water, sand.

Queimada
islets and rock.

From Inferno point, the E. point of the Caldeira, the coast is formed of high cliffs to Greta point, close off which are two islets. Just N. of it is Greta castle; thence the coast is low around the northern side of Guia hill and along the peninsula of Entre Montes. A line of batteries extends all along here, and the coast is fronted by rocks and reefs.

Abreast the peninsula is a large rock, named Queimada, with a number of smaller ones between it and the shore. Two other islets, the northernmost of these dangers, lie about 200 yards NE. of Queimada point, and have the same name. At about 250 yards ENE. $\frac{3}{4}$ E. from the point is a rock which dries at low water. To avoid all these dangers vessels should not approach Queimada islets within 2 cables. The islets serve to mark the limit of a shoal extending alongshore, with from $1\frac{1}{2}$ to $4\frac{1}{2}$ fathoms water over it, toward Greta castle. At the edge of this shoal there are 7 fathoms, and between the points of Greta and Queimada vessels should not come within 15 fathoms.

Horta bay.

High bluff cliffs recommence at the foot of Queimada hill, form the point of that name, and terminate at the southern part of the town of Horta, where there is a coal depot. Thence a sand beach extends northward to the castle of Santa Cruz on a rocky point, near which is the mole. The rocks cease off the town, and a black sand beach extends

to Lagoa fort, the northern defense of the port; here the cliffs recommence and extend along the N. shore of the bay to point Espalameanca. A second signal-station stands on a hill 420 feet high, rising from the brow of the cliffs near the point.

The town of Horta is regularly laid out and well built on a sloping plain at the foot of mount Carneiro, 886 feet high, a conical hill on the parallel of the town. South of the town and NW. of Queimada hill, is a hill with two summits, 208 and 280 feet high, named Mosso. In the town there are several large buildings; among them the convent of San Francisco, with two towers, a little to the N. of fort Santa Cruz; the Jesuit college, near which is a well and a convenient watering-place; the Carmelite convent W. of the town, and La Matriz and La Conceição N. of it. Farther to the N. are Stone hill, 594 feet, Trees hill, 570 feet, and another 549 feet high, all nearly in a WNW. line with the eminence on which the signal-station stands. The Flamengos river flows in the valley formed by these heights and the hill of San Amaro, 553 feet high, and forms at the northern part of the town, between the forts of Lagoa and Bom Jesus, a lake which has no outlet.

Horta

The entrance to the bay is about $1\frac{3}{4}$ miles across, and though it is open to winds from NE. to S. through E., it is one of the best anchorages of the Azores. The SE. winds are the most dangerous, as they blow directly on shore, and when they set in vessels should put to sea.

The 5 and 10 fathom lines follow quite regularly the contour of the shore, the latter being about $\frac{1}{4}$ of a mile from the beach; at $\frac{1}{2}$ a mile there are 20 fathoms, and at 1 mile 30 when abreast the middle of the bay; near the points, however, these depths are found much closer to the shore. The bottom is generally of sand with gravel, shells, and sometimes stone; rock is occasionally found near the points. About $\frac{1}{3}$ of a mile ESE. $\frac{1}{2}$ E. from Espalameanca point is a rock with 2 fathoms water on it. From it point Ribeirinha bears N. $\frac{1}{4}$ E. and cape Guia SSW. $\frac{1}{2}$ W. In entering the bay from the northward an offing of more than $\frac{1}{2}$ a mile should be kept, from Espalameanca point.

Soundings.

Merchant-vessels anchor on the meridian of the Lagoa fort abreast the southern part of the town in 14 to 20 fathoms water, about 4 cables from the shore.

Anchorages.

Men-of-war anchor a little farther E., about 7 cables from the beach, with the N. part of the Jesuit college in line with the middle of the Carmelite convent, in 22 to 25 fathoms water, sand. At this anchorage it is easy to get under way with any wind.

Tides.

High water, full and change, in the bay of Horta is at 11h. 45m. The rise is $4\frac{1}{4}$ feet. The flood sets to NE. and the ebb to SW., with a velocity of $1\frac{1}{2}$ to 2 miles an hour; its greatest velocity is 3 miles.

Directions.

In coming from the S. to this anchorage the only danger is Chapman rock; directions for avoiding this have already been given. Care should also be taken not to draw too close under the land on account of the calms and squalls.

In coming from the N. with a fair wind, there is no difficulty in making the anchorage, and in tacking it is only necessary not to stand on southward of the Guia chapel.

Praya bay.

Point Espalamanca is high, perpendicular, and rounded; a little fort and a lookout are on its summit. A shingle beach at its base extends as far as the village of Praya, in a valley at the southern base of the peak of Frades. There is a landing abreast the town near the left bank of a little river.

The peak of Frades slopes rapidly to the E., and terminates in a high and very remarkable cliff, whence lower cliffs extend to the point of João Dias, nearly on the meridian of point Espalamanca. The bight between these points is called the bay of Praya. It is chiefly frequented by boats from Magdalena in Pico when opposed by southerly winds. They anchor in 17 fathoms, opposite the village with Espalamanca point in one with Guia chapel, over a bottom of sand and shells. Vessels should not anchor too near point Espalamanca, as the rocks of the bottom are but lightly covered with sand.

Coast.

North of point João Dias there are several shallow bights. The coast is formed of cliffs, some of them very lofty, as far as point Ribeirinha, high, steep and rounded, with a little sand-beach at its base, at $\frac{3}{4}$ of a mile from which there is anchorage in 20 to 25 fathoms, off a little water-course emptying through a gap in the cliffs near the middle of the bay. There are a few rocks off the base of the point.

From point Ribeirinha to Cedros, the NW. point of Fayal,

the coast-line is almost straight. A road parallel to the shore is lined on both sides with dwellings. Near the first point stands the village of Ribeirinha, and farther to the NW. Boa Vista, and finally Cedros, all of them on the western slope of the chain named Serra do Caboco. Between the points just mentioned the coast is of rather lofty cliffs with a few rocks, some of them hidden close along their base. There are only two intermediate points at all prominent, Parede and Salao; between these there is a shallow bight, and near the latter a landing-place.

Point Cedros, the NW. point of Fayal, is abrupt and pretty high; a few rocks lie near it. Here the coast turns to the southward and westward to point Praya do Norte, near the bay and village of that name. Like the rest of the coast this part is of cliffs, with but one salient point, that is remarkable for a little conical hill 470 feet high which crowns it. It is named point Jorge, and is high and almost perpendicular.

The bay of Praya do Norte is a bight formed at the northern angle of junction of the western promontory with the main island. There is a sand-beach at the bottom of the bight, and the village is on its western shore. Praya do Norte bay.

Point Negra is the W. point of the island; close to and NW. of it there is a small islet.

Between this point and point Comprida, about 1 mile farther S., there are two rocky islets called Capellinha rocks, Capellinha rocks. lying $\frac{1}{3}$ of a mile off shore. The southernmost is the larger and is nearly round; the other is a vertical needle. Between these rocks and the coast, itself lined with rocks, there is a narrow boat-channel with 5 to 6 fathoms water. The islets are steep-to on the W.

Point Comprida is very low at its extremity, but rises rapidly inland. E. of it is a little bight and a landing-place. Thence to point Varador the coast is of low rocks and only slightly indented; a few sunken rocks lie near it. At point Varador it forms a bight, where there is a landing-place near the village of Ribeira do Cabo. Thence it is again high and steep to point Castello Branco, and all along there are rocks close to. Coast.

Point Castello Branco is a little round steep hill surmounted by a fort, and connected with the mainland by a narrow isthmus, so that at a distance it has the appearance

of an island. A village of the same name is on the mainland to the eastward.

From Castello Branco to the hill of Queimada there are only a few shallow bights, and the entire coast is fringed with reefs and rocks. The intermediate points are, first, Forte, prolonged by some detached rocks on the meridian of the village of Castello Branco, and with a landing E. of it. Then Gaviota, steep and high, W. of a little bay with a sand-beach near the village of Feiteiras; near this point are two little islets not far from the coast. Next is Cavernas, low, and the eastern point of the same bay; it takes its name from a grotto that the sea has cut here in the cliffs. And finally comes Guarda, on which is a little fort; this is the W. point of entrance to Pim bay.

Soundings.

The bank of soundings surrounding Fayal is narrow and variable. In the S. its greatest width is $1\frac{1}{3}$ miles, at which distance there are 190 fathoms, decreasing rapidly toward shore. The bottom is almost altogether rocky, so that this coast and the western, though there the bank is a little wider, are rarely approached by ships. Between the points of Cedros and Praya do Norte there are 200 fathoms at $1\frac{2}{3}$ miles, diminishing rapidly but regularly to 25 fathoms at about $\frac{2}{3}$ of a mile from the coast; sand and gravel are occasionally found here. At point Cedros and along the NE. coast the bank is narrower and the coast is dangerous. In case of necessity, however, vessels can anchor in 38 to 40 fathoms water, sand, at $\frac{1}{3}$ of a mile from the shore.

SAN MIGUEL.

The islands of San Miguel and Santa Maria form the eastern group of the Azores. The descriptions of these islands given below are taken chiefly from the admirable papers of Mr. Consul Carew Hunt, communicated to the Royal Geographical Society, London, in 1845.

Aspect.

The island of San Miguel describes a curved figure of pretty regular breadth as a whole, and occupies an area of 224 square miles. In 1840 there were 18,809 inhabitants, so that it is the largest and most populous of the Azores.

There is considerable variety in the aspect as the island is passed from E. to W. The E. end rises from the bluff sea-cliff of between 1,200 and 1,400 feet elevation to a lofty inland peak, from which a central range, varying in height

from 2,000 to 2,500 feet, runs to the westward, terminating in the Serra da Agoa do Pao, 3,070 feet above the sea. The sea-coast gradually declines in approaching the last point, where it is not more than about 100 feet high. The part next seen is lower, and its outline, as presented by the summits of numerous volcanic monticules, of about 1,300 feet elevation, united in a central ridge more undulating, the western extremity being marked by the conspicuous Serra Gorda, 1,570 feet above the sea; its shores on both sides are low, broken, and rocky. Of the remaining part the aspect is that of a vast truncated cone irregularly cut off at an elevation of about 1,800 feet, and falling on the N., W., and S. sides to a perpendicular coast of between 300 and 800 feet high. The outline is varied by the intervention of peaks thrown up on the summit and flanks, and round the foot of the mountain.

In the higher parts the surface is generally covered with an undergrowth of heaths, cedar, laurel, laurestinas, and other evergreen shrubs, which give the mountains an exceedingly rich and wooded appearance, notwithstanding the inroads of cultivation and the more destructive demand for fuel. Like all volcanic countries the face of the island is uneven and irregular, being deeply excavated by numerous ravines, and roughened by streams of semi-vitrified and scoriaceous lava that resist all atmospheric influences and repel vegetation. Heavy rains falling on the mountains afford a constant supply of water to four lakes at the bottom of extinct craters or subsidences and a number of minor reservoirs, and through them to small streams rapidly running down on all sides into the sea.

It is stated that when the island was first discovered it rose at the E. and W. ends into peaks of equal altitude, but the discoverers then leaving it and returning in the next year were witnesses of a volcanic eruption that enveloped the W. end, when the peak had lost one-third of its height, presenting a broken line of truncation instead of its former cone. The scene of this change is the so-called valley of the Sete Cidades, a plain occupied partly by two lakes, partly by small hills of pumice and scoriæ, 884 feet above the level of the sea, and surrounded by a ridge with peaks of between 1,880 and 2,810 feet elevation.

Mountains.

The high mountains of San Miguel may be divided into

five groups. The first is the eastern chain, of which the peak of Vara, 3,570 feet, is the highest. From this mountain two branches extend southward, having at their point of junction the peak of Passo, 3,040 feet high, in the eastern branch the peaks of Bartolomeo, 2,927 feet, and Nuñez, 2,220 feet.

This is separated from the second or Furnas group by the valley of Provoção and a high, narrow plateau, south of which are the peaks of Monteiro and Sargulho, of 1,668 feet elevation. The highest peak of this group is Caffanhote, in the northern part, 2,345 feet high. South of the main range is the valley of Furnas and the town of the same name, and farther S. is the peak of Gaspar, broken at the summit by a volcanic eruption. West of the latter and S. of the peak of Ferro, in the western part of the valley, lies the lake of Furnas, in which the water is 8 to 100 fathoms deep. Both of these chains slope rapidly and regularly to the northern shore, and irregularly to the southern.

West of these an extensive plain, with scattered conical hills, and in its western part the lake of Congro, separates the second range from the third, that of the Agoa do Pao, where at the summit of the chain there is the lake of Fogo, with an average depth of 15 fathoms. The highest mountains here attain a height of 3,070 feet, falling gradually northward to the village of Ribeira Grande, and rapidly southward to Villa Franca and Agoa do Pao on the S. shore of the island.

The lowest part of San Miguel is occupied by the fourth group. The loftiest peak of this group is Serra Gorda, 1,570 feet high, and near the center are the peaks of Fogo and Pedra, 1,023 and 1,030 feet high. There are also many secondary peaks and constant marks of volcanic action.

Waters.

The spring-water in traversing parts under the influence of present heat, or changed by that of the past, takes up their chemical constituents. Thus the mineral waters of San Miguel are produced, and they are held in high estimation locally for their medicinal qualities, and are not unknown to men of science abroad.

These waters are divided, according to their particular elements, into the following four kinds: *First*, the Caldeiras or Boilers, containing a volume of carbonic acid, with sulphuretted hydrogen and about two-thousandth parts of

solid residuum, silica, alkaline carbonates, and neutral salts. *Second*, hot chalybeate of the Quenturas, containing a volume of carbonic acid and one-thousandth part of residuum, two-thirds carbonates of lime and soda, with muriates and silicates of soda and potash, and nearly a fourth oxide of iron. *Third*, Agoa Feuca, a tepid chalybeate, containing less carbonic acid and more iron than the second. *And, fourth*, the cold Agoa Azeda or acid water, containing a volume and a quarter of carbonic acid and two grains of residuum in an imperial pint. Of these two grains about a fifth is carbonate of iron, the remainder alkaline, carbonate and sulphate, with silica and carbonate of lime.

Of these waters the first is used for baths only. It is very useful in chronic rheumatism and in removing the fat and bloated habit brought about by high living and inaction. It has been recommended for paralytic loss of power in the limbs, gravel, secondary syphilitic symptoms, chronic gout, dry and hard skin, unless attended by inflammation liable to be increased by stimulants; and, finally, for the prevention of diseases to which the full habit of an indolent life may lead. The temperature of this water is nearly 210° F., the boiling-point at the height of the Furnas above the level of the sea.

A similar use is made of the second, efficacious in restoring health to convalescents, and giving tone to the habit of those in want of it. It is particularly recommended for diseases peculiar to the female constitution.

Less use is made of the third, although it is a valuable adjunct to the medicinal virtues of the valley. It contains more iron than that usually drunk, is free from salts, and, being tepid, can be taken internally in cases where cold water would be improper.

The fourth spring is only used for drinking; its transparency, sparkling appearance, and acid taste rendering it agreeable notwithstanding its strong chalybeate character. Sick and well drink it indiscriminately, nor do any bad consequences appear to ensue, though it acts on the kidneys of those not accustomed to it.

The population of San Miguel is distributed among 4 towns and about 22 villages. There is a considerable pre-
Resources.

to the Brazils. Government effort is made to prevent this drain, but without effect. The soil is extremely fertile, producing abundance of corn, maize, beans, and sweet potatoes, with other vegetables and fruits. Cattle, sheep, pigs, and poultry are raised, and wine enough for the consumption of the inhabitants. Linen is manufactured, but has lost its importance as an article of export. A coarse woolen drugget employs a few domestic looms. A rough, weak pottery and an inferior lime are made. Wood and water are abundant. Ponta Delgada is the best place for vessels to obtain stores, &c.

Climate.

The climate is temperate, and the variation of temperature between winter and summer so inconsiderable as not to totally interrupt agricultural labor. The extremes of sensible heat and cold are, however, increased by the humidity of the atmosphere. In consequence of this humidity heavy thunder-storms are unknown, although ships have been struck by lightning in the neighborhood.

Taking the average of 5 years, (1840-44,) and reducing the observations to apply to the sea-level at half tide, the barometer ranges between 30.69 in. and 29.46 in., the extremes having been 30.87 in. and 29.10 in., and the mean pressure 30.166 in.

As in summer it is seldom that clouds do not float in the atmosphere to offer an occasional mitigation of the sun's heat, so in winter there are few days when this is not felt, and the changes do not materially affect health, personal comfort, or the operations of out-door business.

Winds.

There is no regular characteristic in the winds, except a prevalence at times from the NE. or NW., and the ordinary change from a SW. gale to a moderate NW. breeze. The latter circumstance is well known to mariners of the trade, and taken advantage of by them in returning to port after being compelled to go to sea by a gale from seaward.

During the 5 years (1840-5,) there was a mean number of 9 calm days, and the following number of each wind :

Wind—N., NE., E., SE., S., SW., W., NW.

Days—27, 110, 20, 40, 17, 51, 20, 71.

Indicating that the island is removed from that part of the Atlantic where westerly winds generally prevail, and has a preponderance in the ratio of 37 to 26 of northerly and easterly over those from other points of the compass.

Storms are not frequent nor generally of long duration, but they are heavy while they last. They have been found, by observations carefully registered, to possess a decidedly rotatory character, (interfered with, however, by the great altitude of Pico,) but not a regular course of progression.

Storms are generally distributed as follows through each year:

January	1		August	1
February	2		October	1
March	2		November	2
June	1		December	4

The time of high water, full and change, at San Miguel is 12h. 30m. The rise is 6.6 feet. Tides.

West of this island and to the southward the general set of the current is to SE. or NW., with a velocity of $\frac{6}{10}$ of a mile to 1 mile an hour. Currents.

The steep, western point of the island, Ferraria, is crowned by the hill of Camarinhas, 687 feet high. From its base a low point of rocks, fringed by a reef, extends out for $\frac{1}{3}$ of a mile, and the sea often breaks at a greater distance. Several heads of rock show on the reef, and there are 20 fathoms water at its edge. To the southward of the point there is a line of rocks extending 450 yards SW. from the coast. Coast.

About 1 mile NW. by N. from the point is the site of Sabrina island, now covered with 15 fathoms water. Its formation and subsequent disappearance will be noticed farther on.

The coast between Ferraria and Delgada points is high, steep, and completely exposed. A few rocks lie close to the base of the cliffs, and on their brow there are the three villages of Candelaria, Feteiras, and Relva, connected by a road which follows the shore-line around almost the entire island.

Beyond point Relva the coast is lower to point Delgada, off which there is a shoal and a rock about 325 yards distant. This point is the W. point of entrance to Ponta Delgada bay. Fort Santa Clara stands on the point, and in the fort there is a light-house building,* from which, when finished, there will be displayed a *fixed white* light, visible 10 miles in clear weather. Light: Lat. 37° 44' N.; long. 25° 40' W.

* See note at end of volume.

Ponta Delgada bay. The bay of Ponta Delgada is comprised between the points of Delgada and Galera. The latter is low and fronted by rocks and islets. The coast between forms a rather shallow bay, exposed to winds from E. to W. through S., but well protected from all others.

Ponta Delgada. Ponta Delgada, the largest and most important town, and the capital of the island, is on the western shore of the bay. It contains about 20,000 inhabitants, and is built on the shore, on a low beach fronted by rocks, leaving between them occasional little bights, one of which, in the central part of the town and opposite the custom-house, forms a small port. It is built with tolerable regularity, the streets being straight and broad. The religious edifices are numerous and elegant, and forts and batteries protect the water-front. The church of Santa Clara is on point Delgada, and an old tower stands E. of the town, near the water's edge. There is a little hill in the eastern part of the town, with the convent of Santa Madre on its summit, and the citadel of San Braz is on the shore in the western part.

Just E. of the latter is point Areyal, which protects a small inlet or basin, with 1 fathom water in it, where the native craft find shelter in any weather. It is remarkable that a port of such active trade as Ponta Delgada is wanting in three important requisites: banking establishments, mail-packets, and a repairing dock. A small basin, called the Areal, has generally served for the repair of vessels of light draught without offering any facilities for the trade generally, or to the more important traffic passing near the Azores between other countries. It is now in course of reconstruction, and will be deepened to 15 feet for the purpose of receiving such ships of that draught as may come for repairs. A larger dock has long been projected, but the resident capitalists are unwilling to undertake it.*

Between point San Pedro, surmounted by a fort, and the custom-house, there is a small bay with 2 to 2½ fathoms water in it.

Custom-house shoal. About 70 yards S. of the Custom-house point there is a small shoal of the same name, with 1 fathom water on it.

* The breakwater now in course of construction at Ponta Delgada is already sufficiently advanced to afford shelter to the local traffic of the island. (Nautical Magazine, October, 1873.)

The sea generally breaks on this rock, between which and the point there is a narrow boat-channel.

Another small shoal with $\frac{1}{2}$ a fathom over it lies 200 yards SSW. of San Pedro point, from which it takes its name. There are 4 fathoms water close to it on all sides. These two dangers are on a rocky plateau, which fronts all the town and extends irregularly into the bay, but never reaching more than 2 cables off shore. The soundings on this bank are from 1 to 4 fathoms, and at its edge the depth increases suddenly to 6 and 7 fathoms, sand.

Beyond the 7-fathom line the soundings increase gradually off shore to 25 fathoms at 1 mile. Beyond this depth they increase irregularly to 45 fathoms at $1\frac{1}{3}$ miles. At $1\frac{1}{2}$ miles there are 120 fathoms, and at 2 miles 200 fathoms, over generally sandy bottom.

There is no difficulty in making the anchorage at Ponta Delgada. A good position (because here a ship can slip and put to sea with any wind to avoid a southerly gale) is in 40 fathoms water, sand, about 1 mile from the town, with point Delgada bearing NW. by W., the citadel NW., and the old tower N. $\frac{1}{2}$ E.

Other anchorages which may be used in the fine season are $\frac{1}{2}$, $\frac{1}{3}$, or $\frac{1}{4}$ of a mile S. of San Pedro point in 16, 14, or 12 fathoms water, sand bottom.

A vessel forced by southerly winds to leave this anchorage, and desiring to return to it, should round the western part of the island and await the NW. wind, which almost always follows. Vessels which have, on the contrary, gone to the eastward, have sometimes taken 10 days to work back against the NW. wind and the SE. current.

The following signals are made from the flag-staff of the customs wharf:

Red flag: vessels at anchor should weigh at once; bad weather.

White flag: vessels in sight can come to the anchorage; no danger.

Red flag with white border: no boats should be sent on shore, as landing is dangerous.

Five mooring-buoys have been placed in the roadstead of Ponta Delgada and are of great assistance to vessels obliged to leave the anchorage.

- Light. From 1816 to 1818 a light was exhibited from the tower of the cathedral, visible 6 or 7 miles. Since then there is no report of it, and it probably no longer exists.
- Calpeta inlet. Eastward of San Pedro point the coast forms a bight, much obstructed by rocks, at the head of which is the inlet or creek of Calpeta with a convenient landing. East of the inlet are several buildings and the old tower before mentioned. This latter is probably the remains of an old lighthouse for the coast or port.
- Bay coast. Between the points of San Pedro and Rostô do Cão the coast is very broken, and is fronted with rocks all along. The latter point is rather lofty, rocky, and prominent. It is steep-to, with 5 fathoms water alongside of it, rocky bottom, and 7 fathoms water, sand, 200 yards S. of it. Beyond this the soundings augment regularly to 120 fathoms at $1\frac{1}{3}$ miles. This point is the eastern limit of the regular roadstead, and is capped by a little conical hillock.
- Port Caetano. From point Rostô do Cão to port Caetano the coast is low and a few rocks lie off it. A few buildings stand on the points that form the port. Vessels riding out their quarantine anchor off the port in 12 fathoms water, sand, at $\frac{1}{3}$ of a mile from the coast, or farther out in 30 fathoms. The next point, Alagoa, is low, and just inside of it the village of the same name is seen, surrounded by vineyards.
- Port Carneyros. East of this point is the little bay of Alagoa and the still smaller port of Carneyros, a mere break in the coast completely open to the S. It is only used by the native boats. Beyond the port is point Agoa, the western point of port Cabassos, at the head of which there empties a river which traverses the town of Agoa do Pão. Point Galera is the eastern point of this port and of the bay of Ponta Delgada. The coast in its vicinity is clean and safe.
- Tofiño rock. At $\frac{1}{2}$ a mile SW. of this point Tofiño says there is a rock as large as a boat awash at low water. It is still marked on the charts, but Captain Vidal, R. N., searched for it without success in 1844, and states that no such danger occupies the given position.
- Port Cabassos. Port Cabassos is a bight whose coast-line is formed of high cliffs, where there is only a boat anchorage. Rocks and reefs lie thickly along the shore, and the only landing is near the mouth of the river which descends from the heights of the Serra da Agoa do Pão.

Point Galera is at the base of a little peak, on the western slope of which stands the town of Agoa do Pão, of no great importance. The point itself is bluff, and the rocks and islets at its foot extend out for $1\frac{1}{2}$ cables. In 1818 there was a light on this point, visible 6 or 7 miles, but it is no longer exhibited. Coast.

From point Galera the coast is of rather lofty cliffs to Pyramida point, high and abrupt, forming between them a shallow bight. The latter point is prolonged to SSE. by some rocks and a reef extending $\frac{1}{5}$ of a mile to seaward, where the sea generally breaks. At 300 yards SW. by S. from the point there is a rock awash, and between it and the reef there is a channel 200 yards wide, with 8 or 9 fathoms water, that can be used only by small craft and in fine weather.

From Pyramida point to Villa Franca the coast forms several little bights; the first of these, just E. of the point, is almost semicircular in form and has a sand-beach along the base of the high cliffs which inclose it, but the entrance is obstructed by rocks.

Point Forca, to the SW. of Villa Franca, is high and abrupt, with a few rocks close off it.

The roadstead of Villa Franca commences at this latter point. The town is built along the shore, on the brow of the cliffs, lowest on the eastern side; E. of the town a little river empties, and just beyond this there is a small sand-beach; at the farther extremity of the beach there is a salient rocky point named Area, at the foot of cliffs on which is the fort of the same name, defending the eastern part of the town. Villa Franca.

The coast between Forca and Area points is broken into little inlets and fronted all along by a bank of rocks and reefs reaching but a short distance out. At the edge of this bank there are 2 to 3 fathoms water, sandy bottom. Point Area is prolonged for one cable to the S. by a reef. Another defense of the town is a fort in the eastern part, named Castello.

Villa Franca island lies about 3 cables S. of Forca point. There are 3 to $4\frac{1}{2}$ fathoms water in the channel between, with bottom of sand and sometimes rock. This remarkable islet is high on the S. and SW., where it attains an elevation of 80 feet, and low on the SE., while in shape it may Villa Franca island.

be compared to a broken ring. A gap in the NE. part forms the entrance to a circular basin where 4 or 5 small vessels can lie at anchor. The entrance is very narrow and only about 2 feet deep, but in the basin itself there are 6 feet water.* During SE. gales the water in this singular little port is much disturbed, and it is then dangerous.

Roadstead.

The roadstead of Villa Franca is between the island and the beach above mentioned. From the beach to the parallel of the island the depth increases gradually from 2 to 12 fathoms. Small craft moor as close to the island as possible and off its NE. part, and even then are but poorly sheltered from SW. winds. Some rocky patches are scattered over the bottom and must be looked out for.

Anchorage.

Beyond the parallel of the island the depths augment regularly and rapidly to 60 fathoms at $1\frac{1}{3}$ miles S. of the town, and thence more rapidly to 165 fathoms at 2 miles. Vessels anchor in 9 fathoms water, sand and gravel, with the NE. point of the island bearing WSW. $\frac{1}{2}$ W., the Castello NW. by N., and fort Area N. by E. $\frac{1}{8}$ E., about 330 yards from the reef off Area point. This anchorage is recommended by Captain Vidal, R. N., but perhaps a preferable one is with the NE. point of the island on the same bearing as before, and the Castello bearing N., which is more removed from the breakers of point Area; in any case these can only be used in fine weather, as they are very dangerous with southerly winds; during the season of the latter it is necessary to anchor farther out and to be always ready to put to sea.

Provisions and water are in abundance and can be easily procured.

Coast.

From point Area to point Garça the coast is of high cliffs broken by little inlets. The latter point is high, steep, and clean; W. of it there is a landing, and to NNW. the village of the same name.

Thence to Lobeira point the coast forms a shallow bay backed by high lands; the peak of Pombas, 1,400 feet high, stands at the head of the bay, W. of Lobeira point. A short distance E. of the point there is a covered rock, and 340 yards S. of the same point is the islet of Lobeira, leaving a channel between it and the shore, with 5 fathoms

* These soundings are given by Kerhallet; the latest charts, however, give them as 2 fathoms and 6 fathoms.—Tr.

water. The islet is steep-to, and immediately around it there are 7, 9, and 14 fathoms.

Between the points of Lobeira and Fayal there is a wide shallow bay, in which are 2 prominent points. The first, Albufeira, is fringed with rocks, and just E. of it is the village of the same name, standing near the beach. The second, Ribeira Quente, is low, sharp, and projecting. Between this point and the village of Albufeira there flows the river Quente, (Warm river,) so called on account of the boiling springs in its course. It is one of the largest rivers in the island, rises in and is supplied by the waters of the Furnas, and after a tortuous course of rather more than 4 miles, reaches the sea in a mouth 20 feet wide, and a mean of 18 inches deep. From point Ribeira Quente to point Fayal the coast describes a regular arc, and is formed of lofty cliffs, in which there is a break at the village of Povoação. A river which traverses a valley of the same name disembogues near the village, and at $2\frac{1}{2}$ cables off the mouth of the river, and SE. from the village church, there is a sunken rock, where the sea generally breaks. There are 3, 5, and 7 fathoms water close to this danger.

There is a good bottom of sand, or sand and gravel, in that part of the bay between points Ribeira Quente and Fayal, and in case of absolute necessity a vessel can anchor in 9 to 53 fathoms water; but the soundings are very irregular. The 100-fathom line is about $1\frac{1}{3}$ miles from the coast, except abreast the Quente river, where the bank suddenly narrows, and 100 fathoms are found at $\frac{1}{3}$ of a mile from the shore.

Anchorage.

The village of Fayal, E. of the point of this name, is crossed by the Moinhos river, that flows down through the valley formed by the two chains of mountains, separating at the peak of Passo Alto. The coast is clean along here, and the shores are high, being formed of cliffs, with a sand-beach along their base.

Moinhos river.

Point Retorta, the SE. point of the island, is lofty, rounded, and abrupt. A few rocks lie near its foot. From there to Ribeira, the NE. point of the island, the coast is high and steep, the cliffs rising from a narrow sand-beach. There are no dangers off this eastern shore, except a few rocks showing close to the beach. The only villages are Agoa Retorta, a little in the interior, and between two

Coast.

streams, and Nazarete, in a little port of the same name, and near the chapel of N. S. da Mai, almost on the brow of the cliffs.

To the southward of Ribeira point a ravine is formed by the peak of Griesta on the E., and some of the mountains detached from Vara peak on the W., through which a torrent flows. Near the point are the hamlets of N. S. de Conceição, N. S. de Rosario, and San Jorge. The point itself is high.

From point Ribeira to point Achada the coast is broken by several ravines and indented with several inlets. It is formed throughout of rather low cliffs, rising from a narrow sand-beach. Between these two points is that of San Pedro, and in its vicinity the town of the same name. In a shallow bight, E. of this point, are the rocks named Penedos de San Pedro, near the beach.

On the summit of point Achada is the village of like name, and a little W. of it is point Achadinha. Between the latter and point Ajuda, farther W., there is a bay, in the western part of which a landing may be effected in a gap in the coast, overlooked by a little conical hill.

Point Ajuda is low, but the lands rise rapidly in the interior. To the southeastward of the point is seen the chapel of N. S. do Ros, and to the westward the village of Fanais dos Reys Magos. All along this part of the coast torrents fall down through the ravines, and some few rocks and reefs lie close to the shore.

Port Formosa.

Between point Ajuda and Morro Grande, a steep hill terminating in a low, broken, and projecting point, the coast forms a wide bay, and curves more rapidly as it approaches the latter point. The coast is formed of low, broken cliffs, with many torrents falling into the sea. In this broad bay the only port is that of Formosa, between the points of Formosa and San Bras, and it is only fit for boats. The bottom is of rock. Near the port is the village of Nossa Senhora da Graça. All this part of the coast is clean, with the exception of here and there a few rocks near the base of the cliffs. Maya reef is a rocky ledge, midway between points Ignes and Maya; and the latter point, according to Captain Vidal, is clean and safe, though Tofiño makes the mistake of saying that reefs extend from it for 3 miles to seaward. There is a little bight and landing E. of point

Maya, and at the village of the same name. Westward of Formosa point is the peak of Trindade, a small conical hill, and W. of this there are two others, and then the hill of Morro Grande. East of this point, and under point Portinha, there is a little inlet and a landing.

Point Morro Grande is steep-to; W. of it the coast makes a rapid bend and forms a little bight, of which the western point, Ribeirinha, is low and sharp. To the southward of this point stands the village of the same name, and a little in the interior the chapel of San Antonio.

The town of Ribeira Grande, which gives its name to the bay between the points of Ribeirinha and Rabo do Peixe, is large and well built; with the surrounding district it numbers 15,000 inhabitants. It stands on a plain, gently inclined toward the sea, and at the end of a broad valley watered by the river of the same name. Ribeira Grande

The bay of Ribeira Grande is completely exposed to winds from NW. to NE. through N., and the anchorage is inconvenient as the heavy sea frequently interrupts communication with the shore. In consequence of this all produce is taken overland to Ponta Delgada to be shipped. In fine weather, however, vessels can anchor in this bay and obtain supplies. A rocky bank extends along shore and sometimes reaches $\frac{1}{2}$ a mile to seaward, but beyond this bank there is a good hard bottom of fine sand where vessels can anchor in 25 to 57 fathoms water. Ribeira Grande bay.

Off the beach in front of the town there are 2 fathoms water, and thence the depth increases regularly to the northward. At $\frac{1}{2}$ a mile there are 10 fathoms, at 1 mile 20 fathoms, at 2 miles 50 fathoms, and at 3 miles 100 fathoms. The bottom to about $\frac{1}{2}$ a mile from shore from the outer limit of the bank is generally of sand, sand and shells, and sometimes pebbles.

There is no difficulty in making the anchorage of Ribeira Grande, but in letting go, a position should be taken that will allow of doubling point Ribeirinha with a NW. or N. wind. This point is steep-to and there are 23 fathoms water close to it. With this in view a convenient anchorage is with Morro Grande point bearing E. and the middle of Ribeira Grande S., a little more than a mile from the town, in 35 fathoms water, sand. Anchorage.

Rabo do Peixe
shoal.

At $\frac{1}{2}$ a mile NE. by N. from the point of the hill Rabo do Peixe, there is a shoal of the same name in 4 fathoms water; and around it there are 9 to 12 fathoms. This is the only hidden danger in the bay of Ribeira Grande. W. of the point the coast forms several projections, on one of which is the village of Rabo do Peixe; it is 3 miles from Ribeira Grande.

Coast.

Between the points of Rabo do Peixe and Fanais is the low point of Calheta, with the village of the same name to the westward, and E. of Fanais point is an inlet and landing near the hamlet of San Pedro. Farther W. is the hill of Capellas connected with the shore by a low plain, on which is the town of Capellas at the entrance of a ravine. NW. of the hill there is a little bight, and another SE. of it, the only safe landings for boats along this part of the coast. One or the other is used according to the prevailing wind.

From the point of the hill of Capellas to Bretanha point the coast is of rather low cliffs, with rocks scattered along their base. In this extent there is the village of San Antonio near the point of the same name, and farther on the village of Ajuda near point Costa. Landing may be effected E. of point Costa and at the foot of the little peak of Vermelho, 858 feet high, in a small inlet where a brook empties. The cliffs here are higher.

Lombinha
rocks.

At $\frac{2}{3}$ of a mile E. of point Bretanha there is a group of rocks named Lombinha lying off the coast, leaving between a narrow channel with 4 fathoms water. The largest and most distant of these rocks is 450 yards off shore.

Point Bretanha, the N. point of San Miguel, is high and rounded, and is formed of perpendicular cliffs. A few rocks lie close to it. As it projects but slightly, it is hard to distinguish when seen from the NW. The village of Bretanha is inside the point, at the foot of a peak 1,052 feet high.

João Bom bay.

From point Bretanha the coast trends southerly and then westerly to Mosteiros point, forming the bay of João Bom. Rocks lie all along the coast and extend farthest to seaward near point Mosteiros, itself prolonged by a reef for $\frac{1}{3}$ of a mile, at which distance there are 6 fathoms water. The direction of the reef is to NW., and, according to Tofiño, the sea breaks at a distance of 3 miles in bad weather, so that it must be carefully avoided. The sharp, truncated

peak of Maffa is a little in the interior, and from its remarkable shape forms a good mark for this bay.

The village of Mosteiros is S. of the point of this name. Mosteiros islets.
The coast along here is fronted by rocks and reefs, with narrow boat-channels between leading to the shore. The Mosteiros islets are on the parallel of the southern part of the village. The largest and farthest out is high and steep, and is pierced so that the sea rushes through it. This one is about $\frac{1}{2}$ a mile off the coast, and inshore of it there are four smaller ones.

From point Mosteiros the coast forms a shallow bight with a broken coast-line extending to point Varzea, high, steep, and surmounted by a little peak. It is prolonged for $\frac{1}{4}$ of a mile to NW. by a reef. The site of Sabrina island is nearly on the parallel of this point. Thence to Ferraria point the coast is broken and inaccessible.

The channel between San Miguel and Terceira was carefully explored by Captain Vidal, R. N., in 1843-'44, at which time no dangers existed, and no bottom was found with a line of 170 to 195 fathoms. Channel. But this channel has been and still is the theater of submarine disturbances, resulting in the successive appearance and disappearance of very dangerous shoals, &c. At various periods islands of considerable size and height have been thrown up, and this fact is the more surprising since, as stated above, no bottom has been found at 195 fathoms, and it is difficult to conceive of so prodigious an expansive force as is necessary to produce such wonderful results.

The first notice of such a fact was given in 1638. Smoke was seen rising from the sea where a volcano existed, but when the eruption ceased the lead gave a depth of 79 fathoms over the spot.

The second occurrence of the kind (doubted by Tofiño) was in 1720. It was described in a letter of the 11th March, 1721, written to the regent by M. de Montagnac, French consul at Lisbon, and also by M. Sauvaire, consul-general at Madeira, in April following, detailing a reconnaissance of the island by the commander of an English corvette. This officer sailed around the island at a distance of about 6 miles, a nearer approach being prevented by the heat. It was again examined in July, 1721, by a French pilot named Leutier, who approached it within a musket-shot. Here he

found a depth of 13 fathoms water, black sand, and on a nearer approach $5\frac{1}{2}$ fathoms. The bottom was so hot that the tallow was melted from the lead. The latitude given by Leutier was $38^{\circ} 24'$, and the circumference of the island 1 league. It was so high that it could be seen for 8 leagues.

This eruption took place the 31st December, 1720. Toward the end of 1721, flames, stones, and smoke were still ejected, and visible from San Miguel. The island was stated to be 18 leagues NW. by W. from the W. point of San Miguel, and 13 leagues SE. by E. from the SW. point of Terceira.

In 1722 the island disappeared, leaving a shoal or reef $1\frac{1}{2}$ leagues long, which has in turn completely vanished.

If the rarity of events of this nature has rendered some doubtful of the verity of this case and made others disbelieve it, a thoroughly authenticated case of later date ought to destroy any incredulity.

In the early part of 1811 a most awful and tremendous explosion of smoke and flame issued from the sea at the distance of half a league from the shore at the western end of the island of San Miguel. The flames were first seen on the night of the 1st of February. From the depth of about 40 fathoms in the ocean issued smoke, fire, cinders, ashes, and stones of an immense size; thus a dangerous shoal was gradually formed, and the brig *Swift* was lost on it before its existence was known. On the 10th of June the crew of the British sloop-of-war *Sabrina* observed columns of white smoke rising from the sea, and then smoke and flame. On the 18th the *Sabrina* approached the volcano as near as she could with safety, as it was still raging with unabated violence. On this day they observed the mouth of the crater just showing above the sea, and by 3 p. m. it was about 30 feet above the surface of the water. On the 19th it was about 50 feet high and $\frac{2}{3}$ of a mile in length; on the 30th it was about 150 feet high and still increasing in size. On the 4th of July they again visited it and found that a complete island was formed and perfectly quiet. The captain and several officers landed upon it and found it 200 to 300 feet high and very steep.

Subsequently the islet fell by degrees into the sea, and in the middle of October no part was left above water; but a dangerous shoal remained in the place which it had occupied. In February, 1812, smoke was discovered still issuing

out of the sea near the spot. In June, 1841, Captain Vidal, in H. M. S. *Styx*, anchored in 16 fathoms on the site of Sabrina island, and found that the least water thereon was 15 fathoms.

In 1849 the *Nautical Magazine* published a communication from the British consul at the Azores giving notice of a shoal in the channel between San Miguel and Terceira. This new and dangerous shoal was described by three masters—Benj. Pratt, of the ship *William*, of Bangor; Victorino Faleao, of the *Tres Amigos*; and George Perkins, of the ship *Plymouth*, the latter having sighted it on the 25th of December, 1848, and the others on the 31st of the same month. The water broke mast-high over it, and it appeared to be an extensive shoal with several heads. Its position was given between $38^{\circ} 16'$ and $38^{\circ} 18'$ N. latitude, and $26^{\circ} 41'$ and $26^{\circ} 50'$ W. longitude, or nearly in the position of the volcano of 1720. It is stated to be about 35 miles NW. of the NW. point of San Miguel, and vessels passing through the channel should use every precaution to avoid it. In bad weather the sea is said to break heavily on it, but possibly this is not the case in fair weather.

The bank of soundings around San Miguel follows, nearly, the outline of the island, but it projects in two places in a broad tongue at right angles to the direction of the coast. One of these points extends NE. from point Ribeira, the NE. point of the island, and the other to the southward of Ponta Delgada bay.

Soundings.

The bottom between points Ferraria and Galera is of sand or gravel, with rock near shore; indeed the coast seems to be protected by a belt of rocks from the attacks of the waves. With the sand, shells and coral are occasionally found.

From point Galera to point Ribeira vessels can anchor over almost any part of the bank, only taking care to avoid the scattered rocky patches.

The northern coast, from point Ribeira to point Bretanha, is almost inaccessible. The bank of soundings is narrow, and within 30 fathoms the bottom is of rock. Anchorage is dangerous on account of the heavy sea raised by winds from W. to E. through N.; communication with the shore is often completely interrupted and only the native craft frequent this portion of the island.

Maya rock.

Maya rock, with 22 fathoms water on it and 52 to 59 fathoms close to it on all sides, is 2 miles N. by E. $\frac{1}{2}$ E. from Maya point and 3 miles W. of point Ajuda. It is only dangerous in rough weather.

It may be asserted that all the coast of San Miguel is safe, most of the dangers being apparent; but only the southern portion is frequented; here the anchorages, if not altogether safe and good, are at least passable.

SANTA MARIA.

Aspect.

The island of Santa Maria is of irregular shape; about 7 miles in its greatest and 5 miles in its least diameter, and contains an area of 36 square miles, or 27,000 acres. It has nearly in the center the double-peaked mountain of Pico Alto, 1,889 feet in height,* which falls on the E. and W. sides to a shelving base of about 1 mile in breadth, and 850 feet above the sea. To the N. and S. it throws out a range of undulating heights, which terminate at the sea in lofty mural cliffs of more than 200 feet in elevation. The E. side of this range is covered with hills, diminishing in altitude as they recede from the center, and intersected by numerous gorges of increasing width and depth, the channels by which the heavy rains of winter reach their points of discharge. The W. side is a slightly inclining and undulating plain, also cut by ravines, terminating in cliffs more than 100 feet high. The aspect of Santa Maria is therefore on all sides perfectly bold; the central peak distinct; the subordinate range high and of varied outline, and the coast abrupt, precipitous, and based by the usual accumulation of fallen masses.

In its geology Santa Maria is not like the other islands, where the surface is of recent volcanic matter which conceals whatever may have been their original constitution or the progress of their growth. It is of trap formation, and contains, in its beds of marine shells, proofs of its elevation from the sea. The large masses which now appear as small islands off different parts of Santa Maria, form a striking feature in its geology, presenting, as they do, proofs of the immense force by which they were detached. The largest to the westward appears to have sunk on one side, while

* According to the barometric measurements of Captain Vidal in 1843-'44. The English charts, however, give the height as 1,870 feet.

another on the eastward, which contains a cave full of stalactites, would seem to be a fragment fallen from the semi-circular and crater-like excavation of San Lourenzo bay.

On the N. and E. sides, and near the SE. angle, are copious springs of excellent water. In the other parts of the island there are none of any volume, and the inhabitants of the town suffer great privations in consequence during the summer. In the heavy rains of winter the ravines all over the island carry off torrents of water; leaving, however, sufficient to percolate through the higher strata to keep the regular springs open all the year round. At Villa do Porto a ravine has been cut out about 80 feet in depth, the water escaping by a similar cavity in the dike, which leads to Beacon or Facho hill, 758 feet high.

The surface on the W. side of the island is much overlaid with stones, and bears a spare vegetation of grasses and weeds. The central range is covered with the common heath, myrtle, and arbutus of the Azores, and the E. side is occupied, for the most part, with the agricultural produce of the island. Of trees there are a few in small plantations, and there is an increasing inclination to extend the culture of the orange, but the shrubs of the mountains, which now contribute most to the wooded appearance of the surface, are fast disappearing under the axes of the fuel-cutters, and the demand for land suited to the cultivation of corn. The agricultural produce consists of wheat, corn, and oranges, and a small quantity of wine, potatoes, and beans. Cattle, sheep, and pigs, with a few goats, horses, and asses, are pastured on the western part. The land communications are extensive and good, and ox-carts are chiefly used for transporting produce. The population in 1840 was nearly 5,000, distributed among one town and three villages.

Point Castello, the SE. point of Santa Maria, is high, and has a break which forms a peak in the shape of a sentry-box. A vessel may anchor with this point S. by W. and close to it in 9 fathoms water, sand. The bank of soundings only extends $\frac{2}{3}$ of a mile E. of this point, at which distance the depth varies from 30 to 60 fathoms and then increases with almost a sheer fall to 100 fathoms, bottom of rock. A little N. of this point is that of Malha, and near it the village of Malha or Maya. The coast between is very

Resources.

Anchorage.

broken and rather low. A conical hill stands just S. of the village and at the bottom of a bight between the points.

Malha rock.

At $\frac{1}{6}$ of a mile from the shore abreast the village is a rock named Malha, steep-to, having 7 fathoms water on its northern side, and 11 fathoms on the eastern. The channel between it and the coast has 8 to 10 fathoms and is constantly used by small craft. Tofiño considers it safe for large vessels, but other writers recommend them not to use it.

From point Malha to point Romeiros, the southern point of entrance to San Lourenzo bay, the coast is of rather lofty cliffs with occasional shallow indentations. In this extent are met the points of Feiteira, Cedres, and Papagayo, all clean and steep-to.

San Lourenzo
slet.

The rocky islet of San Lourenzo, 275 feet high, lies eastward of Romeiros point, at the southern extremity of San Lourenzo bay. It is shaped like a cog-wheel; two small rocks lie off the SE. part of it, one of them at the entrance of a small inlet where boats may enter. The coast along here is of rather lofty cliffs broken by gaps through which torrents fall down to the sea.

San Lourenzo
bay.

Point Romeiros is high; two rocks lie between it and San Lourenzo islet, and a third is a little to NW. of the islet, inside of which there is a boat-channel with 5 to 6 fathoms water, the coast and rocks being steep-to. Row-boats frequently use this channel in fine weather; the least depth is 4 fathoms. Point San Lourenzo forms the northern limit of the bay. The bay coast taking a nearly semicircular sweep, is of very high cliffs, falling in terraces to the water's edge. On the lowest terrace there are a few houses, whence a road leads over the cliffs to the village of San Lourenzo, a little inland and on a high plateau. In the indentations of the bay-coast there are several sand-beaches and rocks, and reefs extend almost all along. Two water-courses discharge at the head of the bay. The landing is in a little circular bight in the northern part. The soundings in the bay increase regularly from less than 1 fathom near the shore to 20 fathoms, the limit of the sand bottom. Thence to 30 fathoms the increase is regular, but the bottom is of rock, and beyond this depth increases rapidly to 100 fathoms at $1\frac{1}{3}$ miles from shore, abreast the middle of the bay.

The best anchorage is on the meridian of the western part of San Lourenzo islet, with the point of San Lourenzo bearing NW. $\frac{3}{4}$ W., in 14 fathoms water, black sand, or on the meridian of the middle of the island, the point bearing as above; this will place the vessel about $\frac{1}{3}$ of a mile from the point and conveniently near the landing. In less than 20 fathoms water the bottom is of sand, sand and shells, and sometimes gravel; in less than $5\frac{1}{2}$ fathoms there are many patches of rock. Anchorage.

There is no difficulty in making this anchorage, but the bay is exposed to winds from N. to SE. through E. which roll in a heavy sea. Getting under way is difficult, especially with NE. winds.

Water may be obtained by digging in the sand, and a few necessaries may be procured from the village of San Lourenzo.

From point San Lourenzo to Souza, the NE. point of Santa Maria, the coast is of lofty cliffs with heights rising rapidly in the interior. A short distance to SE. and NW. of the latter point are the Souza rocks, on which the sea breaks. Coast.

Point Matos which follows is of rather low rocks, backed by high lands. A reef and a few rocks lie off the point.

Between this and Lagoinhas point, the coast forms a shallow bay where several torrents discharge. The coast is fronted by rocks and reefs, a continuation of those off point Matos extending out about 450 yards. Several of these rocks show. The depth at the edge of the bank or reef varies from 6 to 9 fathoms.

Point Lagoinhas is prolonged by a chain of rocks and islets. The largest and farthest out is $\frac{1}{2}$ a mile NNW. of the point, and bears the same name. It is 277 feet high. When bearing E. $\frac{3}{4}$ N. it looks like a table-rock with a small peak on the southern part. On this side it rises perpendicularly from the sea. There is no channel between it and the coast, but it is steep-to, and on the northern side there are 11 fathoms water. Lagoinhas islet.

A very dangerous shoal, not mentioned by Tofiño, is on the alignment of this islet and point Lagoinhas. It has only 6 fathoms water on it, and between it and the islet there is a channel a little more than $\frac{2}{3}$ of a mile wide. Lagoinhas shoal is steep-to, and it is not known whether the Lagoinhas shoal.

sea always breaks on it or not, but it must be dangerous in heavy weather. A vessel passing between it and the islet should pass pretty close to the latter.

Coast.

From point Lagoinhas to point Cabrestante, the NW. point of Santa Maria, the coast forms several bays. The cliffs of point Ribeira rise in steps or terraces, and the point itself is high. Between this and point Tamuscal, farther W., there is a circular bay with pretty deep water. At the head of the bay there is a little conical peak with a river beside it where boats can enter to take in wood, water, and provisions. Point Tamuscal is abrupt and broken, and beyond it another circular bay is formed terminating at point Frades. This latter point is 150 feet high, and is connected with the main by a low, narrow neck, so that seen from a distance E. or W. it appears like an island. The heights of the interior diminish in passing from point Ribeira to point Frades, and near the latter they reach their least elevation.

Between point Frades and point Cabrestante the coast is comparatively low, and in this part several little bays offer occasional shelter to the native craft. The most frequented of these bays is between Frades point and point Furado, on which is the little fort of Risco. A river empties here, and on its bank there is a village. At $\frac{1}{2}$ a mile WNW. $\frac{1}{2}$ W. from point Furado there is a rock which breaks. It is situated at the edge of a shoal-bank with 2 to 4 fathoms water, which fronts the coast from point Frades to point Cabrestante, and thence to point Pendurados, extending out in places for $\frac{2}{3}$ of a mile. At its edge there are 6 to $7\frac{1}{2}$ fathoms.

Point Cabrestante is low and surrounded by rocks. Maldebarca rock is low and at the edge of the shoal bank above mentioned. It lies $\frac{1}{4}$ of a mile SW. by W. $\frac{1}{2}$ W. from point Cabrestante. Beyond this point the coast is higher, and is of mural cliffs.

Point Pendurados is abrupt and rounded. It is high and safe, though a few rocks lie close to the foot of it.

From point Pendurados to Villa island the coast is of rather lofty cliffs, and shows only a few little projecting points. It is safe but unfrequented, as it is almost inaccessible.

Villa island.

Villa island, near the SW. point of Santa Maria, is of irregular shape, with a little hillock on the summit. The

highest point is 196 feet above the sea. Between it and the coast there is a boat-channel 165 yards wide, with 5 fathoms water in mid-channel. The island is safe and steep-to on all sides.

Malmerendo point, 150 feet high, is almost due E. of the southern point of Villa island. Between these two the soundings are 5, 6, and 7 fathoms, bottom of rock. There is a fort on the summit of Malmerendo point, the W. point of the bay on which Villa do Porto or Santa Maria, the capital of the island, is situated. This town is at the bottom of a ravine through which two torrents flow. The coasts of the bay are of cliffs, and it terminates on the E. at point Marvão, also surmounted by a fort. A few rocks lie off the base of the point. The castle of Santa Luzia, in the SW. part of the town, defends the anchorage as well.

The time of high water, full and change, at Villa do Porto is 12h. 15m., and the rise 6 feet.

The bay of Villa do Porto is very open, and is completely exposed to winds from SE. to SW. through S., so that only small vessels anchor there, and they only in fine weather, as it is almost impossible to put to sea with southerly winds. The bottom, too, is foul and rocky. The ordinary anchorage therefore is eastward of point Marvão, on the line joining points Malmerendo and Malbusco, keeping the fort on Malmerendo open of point Marvão. The anchorage is about 1 mile from the latter point, in 25 to 30 fathoms water, sand. A little farther E. the bottom is of rock again.

There are 240 fathoms water, sand, at 2 miles S. of the town, diminishing rapidly to 73 fathoms at $1\frac{1}{2}$ miles, and then gradually, but irregularly, to 6 and 7 fathoms at the edge of a shoal bank which extends along all the coast of the bay. Some islets lie along the shore on this bank, with channels between, to the landing at the town, near a point a little E. of the castle of Santa Luzia. The bottom is generally rocky, on which account Tofiño gives the anchorage of San Lourenzo, in the NE. part of the island, as preferable.

The deep bight E. of point Marvão is named Praya bay; its eastern limit being point Malbusco, high, and crowned by a little peak. In this bay there is a black point, named Figueiral, or Pedreira, at the base of mount Facho, (Beacon

hill,) 758 feet high. The anchorage of Santa Maria, above described, is nearly on the meridian of this point. It is easy to make, but care must be taken in letting go to choose the sandy bottom. There is only one hidden danger in Praya bay; this is Pescador rock, in the eastern part. It is steep-to, has $3\frac{1}{2}$ fathoms water on it, and 15 to 17 fathoms on all sides. To avoid it in coming from the eastward keep Malmerendo point in line with the northern part of Villa island, which will carry the vessel 1 mile S. of the rock. In coming from the westward keep point Malbusco open to the left or N. of point Castello. These 2 points in line would take a vessel about 300 yards S. of the rock. It is not known whether the sea always breaks on this danger.

The width of the bank of soundings in Praya bay, as far E. as Pescador rock, is $1\frac{1}{3}$ miles, at which distance there are 110 fathoms. Pescador rock is nearly at the edge of the bank, the soundings here passing abruptly from 30 to 145 fathoms. Near point Malbusco the bank is only $\frac{2}{3}$ of a mile wide. West of this point, and quite near it, there is a village and a church.

Beyond point Malbusco the coast is high and bluff. It trends nearly E. to point Castello. A few rocks lie near the intermediate points, the only considerable one being Sul rock, off the point Peñedo das Armas. It has a round top, and is more than 300 yards off shore, leaving a boat-channel between, with 8 fathoms water. This rock is safe and steep-to, having 12 fathoms close alongside.

Soundings.

The bank of soundings along the S. coast is already described. At point Castello the 100-fathom line passes at a distance of $\frac{2}{3}$ of a mile, with bottom alternately of rock and sand; from 100 fathoms to 28 fathoms the change is very rapid. Between points Malha and Cedres the bank widens a little, and there are 128 fathoms 1 mile off shore, decreasing rapidly to 22 fathoms, and irregularly inside of that depth.

At San Lourenzo bay there are 226 fathoms at 2 miles, 128 fathoms at $1\frac{1}{3}$ miles, and 30 fathoms at 1 mile. Inside the latter depth the soundings decrease gradually, and the bottom is generally sandy. This part of the island, therefore, offers the best anchorage.

The bank is also very narrow on the W. side; the bottom is of rock and the depths are very irregular.

Along the N. coast the bank is much wider. From 100 fathoms to 35 or 40 fathoms the diminution is regular, but inside those depths it is not so. In 30 to 35 fathoms, the bottom is generally of rock, though occasional small patches of sand are found. In deeper water, however, the bottom is chiefly sand, with shells or coral, and small scattered rocky patches. From 100 fathoms the soundings augment rapidly to 200 and 220 fathoms.

The N. side of Santa Maria affords neither shelter nor anchorage.

THE FORMIGAS.

The Formigas bank and rocks, as well as the other dangers described below, were carefully examined and described by Captain Vidal, R. N., and the following description is taken mainly from his reports.

The bank of the Formigas lies N. $45^{\circ} 15'$ E. from the island of Santa Maria, at the distance of 19.7 miles from Matos, its NE. and nearest point. It is formed by a submarine mountain of very irregular elevation, and which, traced to the depth of 200 fathoms, was found to extend $6\frac{1}{2}$ miles from NW. to SE. by about 3 miles in greatest breadth.

Near its western margin there is a narrow cluster of black rocks, known as the Formigas, (or Ants,) which are about 800 yards in length, by 150 in extreme breadth; their relative direction being N. and S. The southernmost of them for about 350 yards forms a rather closely connected mass, having a small bay on the W. The northern ones are more separated from each other, and all are comparatively of little elevation, but their profile exhibits a few hummocks. That on the southern extremity is 27 feet above low-water springs, and is in lat. $37^{\circ} 16' 14''$ N., long. $27^{\circ} 47' 06''$ W. From a theodolite station erected here the following bearings were taken: Pico Alto in Santa Maria S. $40^{\circ} 37' 39''$ W.; Pico Castello at the SE. extremity of Santa Maria S. $29^{\circ} 04' 09''$ W.; and Pico Vara, the highest land near the E. end of San Miguel, N. $32^{\circ} 12' 21''$ W., the latter peak being 38.1 miles distant, and Pico Alto 23.4 miles.

The most elevated rock of the group, named by Tofiño "Hormigon," is 35 feet in height, and stands on their eastern side, about 200 yards from the northernmost rock, some-

what more isolated than the others, and having an inclination to the southward.

With smooth water there is no difficulty in landing, particularly on the southern rocks; but in strong winds or a high swell the sea rolls over them all, leaving a black naked surface entirely devoid of vegetation. At 130 yards S. of the southern Formiga is a small rocky shoal, some parts of which are visible at low water; the channel between it and the rock has 5 to 6 and 15 fathoms water over the ridge which connects them, the greatest depth being near mid-channel. Again, 600 yards or $\frac{3}{10}$ of a mile S. of the southern Formiga is another small rocky patch having $4\frac{1}{2}$ fathoms upon it at low water. It is steep-to on the E., W., and S., but on a line drawn from it to the Formigas the soundings are very irregular; 11, 8, and 14 fathoms.

On the N. the Formigas may be approached within a few yards, but a narrow ridge runs out from them in that direction for about 400 yards with varying depths upon it, but no dangers. The outer extremity of this ridge has 18 fathoms on it, with the northernmost rock bearing S., distant about 300 yards. Immediately N. of this it drops quickly into 30 and then 50 fathoms. On the meridian of the rocks soundings extend off to the distance of $1\frac{8}{10}$ miles. On the E. and W. they are quite clear, with deep water close up to them; but on the W. the edge of the bank is not more than $\frac{1}{2}$ a mile off, and at the distance of 200 yards from them the depth on it will be found about 50 fathoms.

Dollabarat
shoal.

S. $47^{\circ} 07'$ E. $3\frac{1}{4}$ miles from the station on the S. Formiga is the western head of a very dangerous shoal named Dollabarat, from the captain of the *Marie de Sibourre*, who saw the shoal in 1788 on his return from Martinique to Bayonne. It consists of two or three rocky heads or knolls, which at low-water springs have only 11 feet water on them. At that time of tide their position is marked by several large white patches, which may be distinctly seen, especially so in bright sunny weather. This shoal is near the southern edge of a rocky ridge which extends from it $1\frac{6}{10}$ miles N. $15^{\circ} 30'$ E. The soundings over it are most irregular, varying from 14 to 28 and 30 fathoms, with 45 and 50 close to its edges; but there are no actual dangers upon it except those comprised within a short radius that is clearly marked on all the charts.

The whole bank of the Formigas, as already stated, is a

submarine mountain, and its varied elevations approach the surface of the ocean in several places. The shoal of Dollabarat is the most eastern of these ridges, and the mountain has a steep but tolerably regular descent from it to the NE., E., SE., and S., the southeastern slope being the most gradual.

The ridge next in extent to the Dollabarat lies $1\frac{1}{10}$ miles to the SE. of the S. Formiga. Its southern end is on a line drawn from that rock to Dollabarat, and it runs thence 1 mile N. 15° E., which is nearly the direction of the Dollabarat ridge. The least water found upon it was 16 fathoms, but the depths vary from that to 28 fathoms, beyond which it deepens abruptly on all sides. At its N. end there are 18 fathoms, and next east 44. Off its S. end are two detached patches, very small; the one has 28 and the other 30 fathoms on it.

Another but smaller ridge occurs on the W. side of Dollabarat shoal, between it and that last described. It is nearly $\frac{7}{10}$ of a mile in length, very narrow, and the depth upon it ranges from 27 to 32 fathoms; its general direction is about N. 10° E.

The quality of the bottom over the bank of the Formigas is principally rock, with frequent casts of fine white sand, broken shells, and small pieces of the branch coral common in these latitudes.

The Dollabarat shoal is a very insidious danger in smooth water, but in stormy weather the seas break over it with great violence. The rocks of the Formigas, and the breakers upon them and upon Dollabarat shoal, can frequently be seen from the eastern cliffs of Santa Maria.

DANGERS.

In 1808, Capt. William Tulloch, of the brig *Equator*, of Tulloch rocks. Portsmouth, New Hampshire, on a voyage from Madeira to San Miguel, was alarmed by some of his crew seeing breakers. After altering his course he still saw breakers ahead, and as it blew too hard to haul by the wind and weather them, he determined as his only chance to endeavor to push through. Accordingly, having taken in every sail except the fore-topsail, he went to the fore-topmast-head himself, and carried his vessel safely through by luffing up and keeping away as he saw necessary. Captain Tulloch counted dis-

tinctly 21 heads of rocks, none appearing to have much water over them, and two showing occasionally above water in the wash of the sea. Their extent, the captain thinks, did not exceed $\frac{1}{2}$ mile from N. to S., and was still less from E. to W. They bore ENE. by compass* from the highest rock of the Formigas then in sight, distant about 10 miles, and appeared very black below water.

It is stated that the breakers on Tulloch rocks have been seen several times since 1808, the positions given agreeing pretty well with that given above, yet both American and English men-of-war have searched carefully and patiently for them without success. Captain Vidal says: "We must express our opinion upon this reputed danger, as formerly upon the apparently well-authenticated statements relative to the Aitkins rock. It looks very like a whale; but seeing the great difficulty there is in discovering small rocks beneath the surface of the ocean, we by no means presume to assert that Tulloch's reef does not exist, but we entertain a very decided opinion that it will not be found in the position assigned to it."

Kutusoff bank. Kutusoff bank was discovered in 1816 by the officers of the Russian American Company's ships *Kutusoff* and *Swaroff* in going from Europe to the NW. coast of America. Being S. of the Azores they noticed a decided change in the color of the sea and some ripples. The *Kutusoff* sounded and found successively 119, 110, 127, and 127 fathoms. The *Swaroff*, 2 miles farther to SE., found 119 fathoms. The officers estimated the bank to extend 10 miles E. and W., and though they saw no breakers, they thought there were rocks awash on the eastern part.

Captain Livingston says: "On our passage in 1819 from Havana to Barcelona, we passed over white water, apparently a shoal, to the southward and westward of Santa Maria. The captain would not allow the vessel to heave-to in order to sound, but I have no doubt in my mind of its being a very extensive bank of soundings." By his calculation this bank was about 1° NE. of the position given for the Kutusoff bank, or in lat. $35^{\circ} 31'$ N., long. $27^{\circ} 19'$ W. This is all the information yet gathered on the subject.

Whale rock.

M. Fleurieu exhibited this rock on his chart of the Azores, at about 29 leagues northward of San Miguel. High breakers

* Variation in 1808 at San Miguel 23° westerly.

were seen by Captain Gradun, of the *Harmony*, of London, in 1800, lat. by observation $38^{\circ} 46'$, and long. by account $24^{\circ} 47'$ W., being nearly the position given by M. Fleurien. In 1863 it was again reported by Captain Gicquau, of the French ship *Mayotte et Nossibé*, who saw a white patch and breakers. Position, lat. $38^{\circ} 42'$ N., long. $29^{\circ} 43' 54''$ W.

The rock has been diligently sought for without success, and it now seems clear that it cannot lie in the position assigned by M. Gradun.

Gough rocks appear on the chart of M. Rochette, 1778. They were seen by Captains Gough and Birch. Captain Beauford, of the brig *Concord*, says that he twice saw them when bound from Newfoundland to Lisbon; that one of them is about 12 and the other 3 feet above water, and that they lie nearly in the longitude assigned them on the chart, but $5'$ more to the northward. Others report having seen them, but the positions do not agree well, the latitude being variously assigned from $40^{\circ} 16'$ to $40^{\circ} 38'$ N., and the longitude from $30^{\circ} 02' 45''$ to 33° W. The rocks may exist.

Gough rocks.

The ship *Chaucer*, Capt. Robt. Henderson, from the Mauritius to Glasgow, states that:

Chaucer bank.

“On October 28th, 1850, at noon, we were in lat. $42^{\circ} 41'$ N., long. $28^{\circ} 45'$ W., steering NW. by W., (true,) with light variable winds from the eastward, and fine clear weather. Having previously observed that the water had changed color about 10 a. m., and since that there was a sensible ripple, at 2 p. m. I sounded and found hard bottom at 48 fathoms. The distance run since noon was about 6 miles.

“At 4 p. m., having steered the same course, in lat. $42^{\circ} 49'$ N., long. $29^{\circ} 4'$ W., sounded and found 50 fathoms, and at 6 p. m., having run about 6 miles, found 70 fathoms, rocky bottom.

“From observing the change of color and ripple at the surface of the water at 10 a. m., and having sailed from that time up to 6 p. m. nearly NW., the bank may probably extend considerably to the SE. of the position where I took my first sounding at 2 p. m.”

This appears quite circumstantial, but yet 1,210 fathoms were found by the U. S. S. *Dolphin* at its SE. extremity.

In M. Bellin's memoir of 1742, a danger is mentioned in lat. $42^{\circ} 30'$ N., long. $24^{\circ} 5'$ W., seen in 1735 by M. Guichardi, commander of the ship *Dauphin*, of Nantes. It has two

Amplimout
rocks.

points of rock separated, and 30 feet above water. This is nearly the position given for *La Basse d'Amplimont*.

These rocks, like the masts of a brig and nearly in the position assigned, were seen by Captain Mills, in the brig *Tamer*, in 1829.

Captain Thos. Alderson, of the *Morning Star*, from Paimbœuf for Quebec, in May, 1842, passed a rock within 2 ship's lengths. It appeared like a ship's anchor-buoy, and was covered with sea-weed. Another rock or part of the same was seen 8 or 10 feet from the one above water. At intervals it covered and uncovered. At the time of passing the rock the ship was in lat. $42^{\circ} 51'$ N., long. $24^{\circ} 15'$ W.

It was also seen by Captain Duff, of the *Esperance*, from Valparaiso to Swansea, in November, 1846, and described as two pointed summits in the hollow of the sea. His position of it is lat. $42^{\circ} 56'$ N., long. $24^{\circ} 30'$ W.

There is no direct evidence to contradict this, and, therefore, it must be left for future decision. In all the cases cited there was no attempt at *verification*.

Such are the reported dangers in the vicinity of the Azores, and in presenting them to the notice of navigators we cannot better conclude than with the words of Captain Vidal:

“Before leaving this subject we would urge upon sea-officers, to whatever service or nation they may belong, the great benefit they will confer on society at large, and their own profession particularly, if, when they do fall in with dangers of the above description, they would make more sacrifice for their *investigation*. The non-*verification* of such dangers when fallen in with, by every means in the seaman's power, appears to us a dereliction of duty, a great public wrong.

“To find a sunken rock in the ocean with such uncertain data as many reports of them afford, is a very difficult matter; and the attempt to do so is attended with very great trouble and very great expense.”

NOTE.

A communication dated Fayal, June 17, 1874, from Mr. S. W. Dabney, United States consul at the Azores, states that—

The sole work that has been thus far undertaken is the breakwater of Ponta Delgada, at the island of San Miguel, and which, although yet far from finished at a cost of \$1,700,000, will be a fine work when completed.

It already answers a good purpose in protecting the fleet of schooners and steamers that transport, during the winter months, the large quantities of oranges produced on the island to various markets, but has not yet been carried far enough to make it quite safe to ride inside, with all winds. It was commenced 12 years since and is solidly built on the "pierres perdues" system. No light-house of any description exists on any of these islands, a want that would be very much felt, were these islands not so small that vessels, caught suddenly under the bold cliffs, escape on one side or the other.

A breakwater at this island has been in contemplation for many years, and is now so far advanced that a preliminary proposal for inaugurating a company to build it, has been laid before the Portuguese government.

No physical changes affecting the harbors have taken place; and, indeed, with the exception of a submarine eruption that occurred off the island of Terceira, the effects of which soon disappeared, there have been no disturbing phenomena for a long period of years.

The commerce of these islands remains very much as it was in former years, with the exception of wine as an export, which, owing to the ravages of the *oidium*, has been suspended for nearly twenty years.

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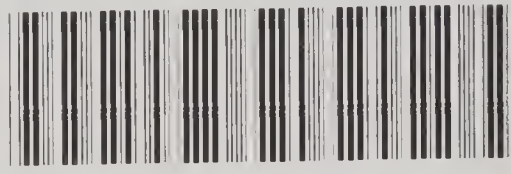


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